

December 2011

NIEHS Spotlight



[NIEHS celebrates intramural scientists](#)

Linda Birnbaum, Ph.D., recognized four intramural scientists and four trainees for their research accomplishments at the 8th annual NIEHS Science Awards Day.



[Strategic plan update: Input still welcome](#)

NIEHS is putting the finishing touches on its five-year strategic plan. The public and other stakeholders are welcome to provide input on the draft.



[Speakers discuss hydraulic fracturing](#)

Two experts on fracking, or the hydraulic fracturing method of extracting gas and oil, discussed the topic on Nov. 21 with NIEHS staff.



[Deputy Surgeon General presents National Prevention Strategy](#) Video

U.S. Deputy Surgeon General Rear Adm. Boris Lushniak, M.D., presented the National Prevention Strategy at NIEHS, a plan to increase the number of healthy Americans.



[NIEHS hosts Pan American Health Organization meeting](#)

PAHO members visited NIEHS in anticipation of a landmark event known as Rio+20, the U.N. Conference on Sustainable Development to be held June 4-6, 2012, in Rio de Janeiro.

Science Notebook



[Panel peer reviews NTP low-level lead draft](#)

A nine-member independent peer review panel concurred with the overall NTP conclusion that low blood lead levels lead to adverse health effects in children and adults.



[ISES meeting challenges exposure science](#)

Gwen Collman, Ph.D., and David Balshaw, Ph.D., of the NIEHS Division of Extramural Research and Training (DERT), spoke at the International Society of Exposure Science (ISES) meeting.



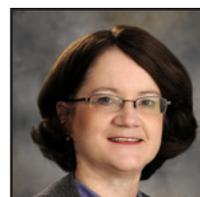
[Wood stove intervention can reduce childhood pneumonia](#)

According to a new air pollution study funded by NIEHS, cooking stoves with chimneys can lower exposure to indoor wood smoke and reduce the rate of severe pneumonia in children.



[Neurotox27 focuses on environmentally triggered disorders](#)

NIEHS scientists and grantees focused on endocrine disruption and sex differences in autism, ADHD, and schizophrenia Oct. 30-Nov. 2 at the International Neurotoxicology Conference.



[A conversation on the state of autism research](#)

Cindy Lawler, Ph.D., who leads an NIEHS portfolio of autism-related research, shared her thoughts about the International Neurotoxicology Conference and the state of the science.

NIEHS Spotlight



[NIEHS fellow departs for UNC career development role](#)

In her new position at the University of North Carolina at Chapel Hill, Erin Hopper, Ph.D., will help guide graduate students through the process of career development.



[American Chemical Society honors newsletter intern](#)

Environmental Factor intern and North Carolina Central University student Melissa Kerr is the winner of the Society's 2011 Undergraduate Award in Analytical Chemistry.



[Annual APHA conference celebrates 100 years of environmental health](#)

NIEHS helped mark the 100th Anniversary of the American Public Health Association's Environment Section, one of the oldest of the 27 sections in the association.



[NIEHS grantee student honored with Wetterhahn Award](#)

Monica Ramirez-Andreotta is the fourteenth recipient of the annual Karen Wetterhahn Memorial Award. She won the award under the guidance of NIEHS grantee Raina Maier, Ph.D.



[NIEHS expands minority outreach at fall conferences](#)

The NIEHS Office of Science Education and Diversity joined others at the Society for Advancement of Chicanos and Native Americans in Science (SACNAS) National Conference.

Science Notebook



[NIEHS figures prominently at annual GEMS meeting](#)

NTP toxicologist Michelle Hooth, Ph.D., delivered the keynote presentation on NTP's two-year rodent bioassays of hexavalent chromium.



[A genomics approach toward understanding autism](#)

The NIEHS Keystone Series Lecturer Valerie Hu, Ph.D., discussed how genomics data may help understand and improve the diagnosis and treatment of autism.



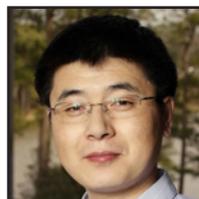
[Duke symposium tackles later life consequences of early life exposures](#)

The Washington Duke Inn in Durham, N.C., was the setting for a Nov. 4 science symposium showcasing the latest research in the later life effects of early development exposures.



[Brain development dependent on thyroid hormone](#)

Scientists at NIEHS have discovered a new mechanism for how thyroid hormone regulates brain development.



[Overcoming phosphate congestion in high energy signaling molecules](#)

In a new study published in Nature Chemical Biology, NIEHS researchers describe, for the first time, the crystal structure of a key inositol pyrophosphate kinase, PPIP5K2.

NIEHS Spotlight



[Hughes honored for worker training efforts](#)

NIEHS Worker Education and Training Program Director Chip Hughes was recognized by the National Counsel for Occupational Safety and Health for promoting worker health and safety.



[SRP grantees gather in Lexington for annual meeting](#)

The NIEHS Superfund Research Program annual meeting Oct. 24-25 featured topics from systemic impacts of pollutants on humans to sustainable remediation techniques.



[Teachers visit NIEHS for science literacy workshop](#)

To help K-12 educators with emerging technologies, NIEHS hosted a science literacy workshop on Nov. 10 for the North Carolina Association for Biomedical Research (NCABR).

Inside the Institute



[NIEHS and CFC celebrate 50 years of giving](#)

NIEHS brought its promotion of the 2011 Combined Federal Campaign (CFC) to a close, with an impressive collection of \$82,152 in charitable contributions.

Science Notebook



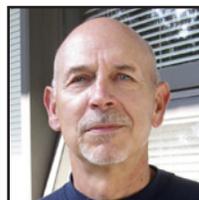
[Winuthayanon presents at NIH Research Festival](#)

As it has for the past 25 years, NIH devoted a week to celebrating its Intramural Research Program. This year's fair featured an invited talk by one of the 21 NIEHS fellows honored.



[Effects of lead exposure on obesity and bone loss](#)

NIEHS grantee and musculoskeletal scientist Edward Puzas, Ph.D., discussed his latest research on the effects of lead exposure on obesity and decreased bone formation.



[Exposome pioneer to be featured at workshop](#)

A workshop on "Emerging Technologies for Measuring Individual Exposomes," will feature pioneers such as NIEHS grantee Stephen Rappaport, Ph.D.



[Susan Amara to present distinguished lecture](#)

The NIEHS 2011-2012 Distinguished Lecture Series returns to the world of neuroscience, with its next talk Dec. 13 on "The Ins and Outs of Neurotransmitter Transporters."



[Testicular toxicology workshop spotlights animal testing alternatives](#)

NTP's Paul Foster, Ph.D., was the featured speaker at an Oct. 26 workshop to discuss *in vitro* alternatives for assessing testicular toxicity.



[This month in EHP](#)

In the December issue, EHP examines the adaptive strategies being implemented to upgrade aging city infrastructure in the face of growing climate change effects.

Calendar of Upcoming Events

- **December 6** in Rodbell Auditorium, 10:00-11:00 a.m. — Keystone Lecture Seminar Series with Andrij Holian, Ph.D., speaking on “Role of the NLRP3 Inflammasome in Mediating Nanoparticle-induced Lung Inflammation”
- **December 6** in Rodbell Auditorium, 1:30-3:00 p.m. — 2011 NIEHS Awards Ceremony
- **December 8-9** at the House of Sweden, Washington, D.C., 8:30 a.m.-5:00 p.m. — The National Academy of Sciences presents “Emerging Technologies for Measuring Individual Exposomes”
- **December 13** in Rodbell Auditorium, 11:00 a.m.-12:00 p.m. — Distinguished Lecture Seminar Series with Susan Amara, Ph.D., speaking on “The Ins and Outs of Neurotransmitter Transporters”
- **December 15** in Rodbell Auditorium, 8:30 a.m.-5:00 p.m. — NTP Board of Scientific Counselors meeting
- View More Events: [NIEHS Public Calendar](#)

Extramural Research

[Extramural papers of the month](#)

- [Chimneys help reduce severe childhood pneumonia](#)
- [Aggressive breast cancer responds to blueberries](#)
- [Mycoestrogens influence development](#)
- [The impact of nutrition labeling](#)

Intramural Research

[Intramural papers of the month](#)

- [One apolipoprotein E allele associated with lower risk of Parkinson's](#)
- [Effects of endothelial CYP2C8 epoxygenase on cardiac recovery](#)
- [Aprataxin structure links DNA repair mechanism to neurodegenerative disease](#)
- [New algorithm identifies transcription factors and coregulators in CHIP-seq data](#)

NIEHS Spotlight

NIEHS celebrates intramural scientists

By Negin Martin

In the early morning of Nov. 3, the NIEHS hallways were draped with nearly 90 posters, ready to impress spectators for the 8th annual NIEHS Science Awards Day. By the time the ceremonies concluded, four intramural scientists and four trainees were recognized by their colleagues for their meritorious research accomplishments. From the Early Career to Scientist of the Year, the awards showcased outstanding efforts from the Institute's most noteworthy contributors.

Science Day originator takes top prize

The distinguished Scientist of the Year award was presented to the originator of Science Day, former NIEHS Scientific Director Lutz Birnbaumer, Ph.D., head of the Transmembrane Signaling Group in the Laboratory of Neurobiology. He facetiously remarked how he expected to have received the award at the first annual Science Day.

In his seminar, Birnbaumer presented an overview of the transient receptor potential cation channels (TRPCs), their mode of action, and their physiological role. TRPCs are a class of molecules studied by Birnbaumer's laboratory.

The Laboratory of Structural Biology was featured prominently in this year's awards by producing the winners of the Early Career Award, Outstanding Staff Scientist, and the Paper of the Year.

The first author of the Paper of the Year, Geoffrey Mueller, Ph.D., a member of the Nuclear Magnetic Resonance Group, was also the recipient of the Outstanding Staff Scientist award. He presented the first scientific seminar of the day about allergens and their structural studies. By solving the crystal structure of the dust mite allergen Der p 7, Mueller and colleagues shed light on the possible mode of action of this allergen in triggering host immune response.

The [research](#) was an excellent representation of collaborative efforts at NIEHS, with scientific contributions from the Laboratory of Structural Biology, Protein Expression Core Facility, and the Laboratory of Respiratory Biology.



An excited NIEHS Director Linda Birnbaum, Ph.D., professed, "It's a good day for science at NIEHS!" Science Awards Day is an opportunity to celebrate the best the Institute has to offer. (Photo courtesy of Steve McCaw)



Mueller kept his audience engaged with visual aids supporting his talk on peanut and dust mite allergens. He is lead author on this year's Paper of the Year. Overall, nine papers were nominated for the award, with the winner being chosen by a distinguished panel of extramural scientists. (Photo courtesy of Steve McCaw)

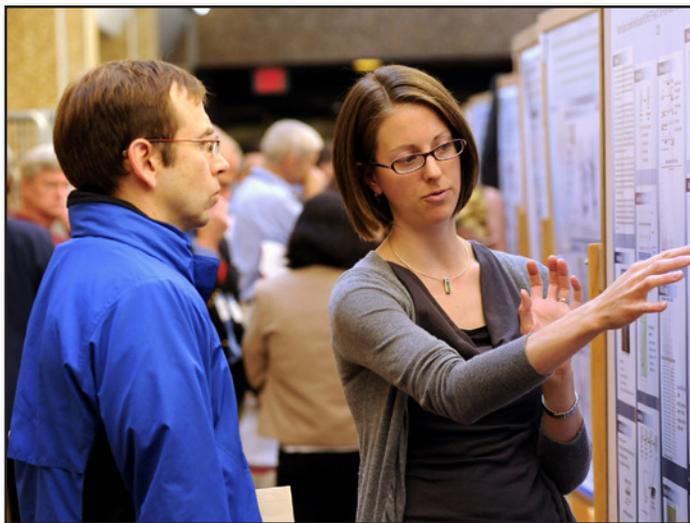
Another shining star from the Laboratory of Structural Biology was Scott Williams, Ph.D., head of the Genome Stability Structural Biology Group and the winner of the Early Career Award. He was recruited by NIEHS in early 2010 as a lead researcher to develop his research interest in DNA break recognition and repair.

The NIEHS Trainees Assembly presented Donna Baird, Ph.D., from the Women's Health Group with the Mentor of the Year Award. Anne Marie Jukic, Ph.D., read several excerpts from the letters of support written for Baird by her pupils.

In the poster category, 88 posters were selected for display, representing all scientific branches of NIEHS. Among them, six exceptional abstracts earned the spotlight for their first authors, who gave oral presentations during the event.

The master of ceremonies and event organizer Joel Abramowitz, Ph.D., concluded the ceremony by announcing the Best Poster Presentations — Shay Covo, Ph.D., Hideki Nakano, Ph.D., and Huiming Gao, Ph.D., — and the Best Oral Presentation winner Kristin Lichti-Kaiser, Ph.D.

(Negin Martin, Ph.D., is a biologist in the NIEHS Laboratory of Neurobiology Viral Vector Core Facility.)



Postdoctoral fellow Erin Hopper, Ph.D., who recently departed for the University of North Carolina at Chapel Hill (see related story), describes her findings to Lars Pedersen, Ph.D., from the Structure and Function Research Group. (Photo courtesy of Steve McCaw)



Newly appointed NIEHS Scientific Director Darryl Zeldin, M.D., and Abramowitz, presented Williams with the Early Career Award. (Photo courtesy of Steve McCaw)



Birnbaumer accepts the Scientist of the Year award from David Miller, Ph.D., former Acting Scientific Director of NIEHS, and Abramowitz. (Photo courtesy of Steve McCaw)

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Strategic plan update: Input still welcome

By Robin Mackar

Components of the draft strategic plan that are ready for your input

Mission Statement

The mission of the National Institute of Environmental Health Sciences is to discover how the environment affects people in order to promote healthier lives.

Vision Statement

The vision of the National Institute of Environmental Health Sciences is to provide global leadership for innovative research that improves public health by preventing disability and disease from our environment.

Supporting Pillars

- Fundamental Research
- Exposure Research
- Prevention and Translational Science
- Health Disparities and Global Environmental Health
- Training and Education
- Communications and Engagement

“There is still time to have input into the strategic plan,” said NIEHS/NTP Director Linda Birnbaum, Ph.D., during the Oct. 28-29 all-hands meeting, where she updated staff on the progress being made to develop the Institute’s new five-year strategic plan. NIEHS also wants to encourage members of the public to email their comments on the draft strategic plan to ehs-strategic-plan@mail.nih.gov.

Before sharing some of the draft components of the plan with NIEHS staff, including new mission and vision statements, and new supporting pillars or themes to support the goals being developed, Birnbaum reminded staff how far we have come in the process since it began in March.

Progress since March 2011

Birnbaum said 231 visionary ideas were received on the dedicated website www.niehs.nih.gov/strategicplan, during the initial call for input. These broad-based suggestions for scientific direction served as an important starting point for the development of the strategic plan.

The [Stakeholder Community Workshop](#) in July brought together nearly 170 participants, representing a broad range of expertise, including NIEHS staff, scientists, regulators, public health practitioners, communication experts, non-government organizations, and research management experts. Birnbaum said the modified open space technology format, used at the July meeting, gave everyone an equal opportunity to propose topics to address how NIEHS can move environmental health forward.

From that stakeholder workshop, 97 themes emerged, which were combined into eight themes (see [Strategic Planning Stakeholder Community Workshop Report](#) for summaries of reports and priority topics).

Developing mission, vision, and supporting pillars

The most recent phase of the strategic planning process occurred Oct. 13-14 in North Carolina.



Birnbaum updates NIEHS staff on the strategic planning process during an all-hands meeting Oct. 28-29 at NIEHS. (Photo courtesy of Steve McCaw)

Approximately 50 individuals, which again represented the broad expertise needed to develop a path for environmental health sciences, were brought together to review all the input compiled to date, including workshop reports, themes, and the ideas submitted through the website, to begin developing the actual content for the new NIEHS strategic plan.

“This was a very intense meeting that resulted in some excellent, thoughtful draft documents,” Birnbaum said.

The participants worked arduously for almost two days in both large and small groups, to develop draft vision and mission statements, as well as six supporting pillars, or major emphasis areas that are likely to advance the field of environmental health sciences the most. A couple of crosscutting themes were also discussed and thoughtfully developed into concepts.

Next steps

Birnbaum said the next steps in the process include developing a defined set of goals that will help layout how the vision will be achieved over the next five years. The public and all other stakeholders and staff will have opportunities to continue commenting on the draft strategic goals, mission statement, and vision statement for the NIEHS, which are posted online at <http://www.niehs.nih.gov/about/od/strategicplan/index.cfm>. Throughout the winter, the NIEHS senior leadership team will be working closely with NIEHS staff to develop implementation plans for each of the strategic goals.

“We will present a public update on the strategic planning process at our [National Advisory Environmental Health Sciences \(NAEHS\) Council Meeting](#) in February,” said NIEHS Deputy Director Rick Woychik, Ph.D., who is leading the strategic planning process. “What’s been made abundantly clear to me throughout this process is that there’s a lot of passion out there around issues in environmental health sciences. I am confident that our plan will capture that energy and passion and set us on course for the next five years.”

Both Birnbaum and Woychik also point out that the NIEHS plan will be aligned with NIH priorities.

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



Staff from throughout the Institute joined Birnbaum, in person or via the Web, to hear an update on how the strategic plan is progressing. NIEHS leadership continues to encourage staff to participate in the planning process. From left to right, Debra Del Corral, Mitch Williams, and Laurie Johnson listen attentively to the progress update. (Photo courtesy of Steve McCaw)



From left to right, NIEHS grantee John Groopman, Ph.D., joins with NIEHSers Sheila Newton, Ph.D., Dori Germolec, Ph.D., Pat Mastin, Ph.D., and grantee Shuk-mei Ho, Ph.D., as part of a small group exercise at the strategic planning meeting in October. (Photo courtesy of Steve McCaw)



David Miller, Ph.D., in hat, serves as group leader for one of the group's helping to define what is meant by fundamental research. NIEHS staff from the Office of the Director, Division of Extramural Research and Training, and the Division of Intramural Research (DIR) provided input. (Photo courtesy of Steve McCaw)



From left to right, Michael Gallo, Ph.D., director of the Toxicology Division and the NIEHS Center of Excellence at the Robert Wood Johnson Medical School at the University of Medicine and Dentistry of New Jersey, lines up with NIEHS DIR scientists Trevor Archer, Ph.D., John Cidlowksi, Ph.D., Darryl Zeldin, M.D., and Rick Paules, Ph.D., to provide input into the strategic plan. (Photo courtesy of Steve McCaw)



From left to right, NIEHS grantee B. Paige Lawrence, Ph.D., shares a light moment with the NIEHS/NTP director at the October meeting. (Photo courtesy of Steve McCaw)



Woychik keeps the conversation flowing during the strategic planning meeting. (Photo courtesy of Steve McCaw)



From left to right, Gwen Collman, Ph.D., and NIEHS grantee and former NAEHS Council member John Essigmann, Ph.D., take time during a hectic meeting to share some stories. (Photo courtesy of Steve McCaw)

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Speakers discuss hydraulic fracturing

By Robin Mackar

The term fracking, or the hydraulic fracturing method of extracting gas and oil from underground deposits, is a subject frequently being discussed by a wide variety of audiences across the country, including the public, media, scientists, industry, and politicians. Two distinguished speakers brought their expertise on this topic Nov. 21 to the staff and leadership at NIEHS, as well as agencies affiliated with the National Toxicology Program (NTP).

John Bucher, Ph.D., director of the Division of the NTP at NIEHS, hosted the two lecturers, as the Institute begins to determine its role in this emerging field.

NIEHS/NTP Director Linda Birnbaum, Ph.D., who attended and participated in the lively discussions that followed each talk, said, “This is one of those emerging areas that we need to do our best to get ahead of the curve, so we can more fully understand any potential health impacts related to the development of this resource.”

Assessing the impact on oil and gas workers

The first speaker, Eric Esswein, a senior industrial hygienist at the National Institute for Occupational Safety and Health and a Commissioned Officer in the U.S. Public Health Service, presented an excellent overview on hydraulic fracturing and discussed his agency’s efforts to assess chemical exposures in oil and gas workers.

“What we’re really trying to do is develop partnerships with the oil and gas extraction industry to identify, characterize, and, if needed, control workplace chemical exposures,” said Esswein as he walked agency representatives through the photo-heavy presentation from his field office in Denver. “There is very little exposure assessment information available to determine if occupational health risks exist for workers in this industry.”

Esswein explained that hydraulic fracturing involves high-pressure injection of water, sand, and chemicals, to release shale-gas trapped in deep underground formations. He provided the audience with an overview of what goes on in the industrial setting related to drilling and hydraulic fracturing.

“There’s a lot more going on at well sites than just the hydraulic fracturing. There’s also site preparation and different types of drilling that occurs well before the hydrofracking can begin. A wide variety of services occur throughout the entire process, including transporting chemicals, water, and supplies to and from the sites,” Esswein said.

Esswein talked about some potential risks to workers, including exposure to volatile organic compounds, dust particles, lead, oil mists, benzene, diesel particulate matter, and silica, among others. He pointed out more research needs to be done, and any new knowledge has to be communicated to the field, so they can put that knowledge into practice to ensure safety and health for the betterment of workers. A link to the NIOSH Fact Sheet describing the study is available at www.cdc.gov/niosh/docs/2010-130/pdfs/2010-130.pdf.



*Workers conduct drilling operations.
(Photo courtesy of Eric Esswein)*

Impact of fracking on surrounding communities

Robert B. Jackson, Ph.D., director of the Duke University Center on Global Change at the Nicholas School of the Environment in Durham, N.C., focused his talk on shale-gas, the environment, and human health.

The majority of Jackson's presentation focused on research he and his colleagues are conducting on several hundred private wells in northeastern Pennsylvania and upstate New York that are near shale formations.

Jackson and colleagues' first paper, appearing in the May 17 issue of the [Proceedings of the National Academy of Sciences \(PNAS\)](#), found evidence that methane contamination, in well water near the shale-gas extraction sites, appears to be related to natural gas extraction. He pointed out, however, that there was no evidence that the drinking-water samples were contaminated with fracturing fluids or brines from the hydraulic fracturing.

Jackson discussed some of the possible mechanisms by which the methane may have gotten into the wells, including the most likely possibility of leaky gas-well casings, and less likely mechanisms of physical displacement of gas through natural and fracturing-induced fissures from the target formation. Jackson also said that more research needs to be conducted to determine the health effects of methane.

In the PNAS paper and in the seminar, Jackson called for more environmental stewardship, and possibly more federal research and regulations, to ensure the sustainable future of shale-gas extraction. "We need systematic, independent data on groundwater quality, before and after drilling operations begin in a region. Having this baseline will go a long way toward preventing environmental impacts, and improving scientific knowledge and public confidence," Jackson said.

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

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Deputy Surgeon General presents National Prevention Strategy

By Ashley Godfrey

U.S. Deputy Surgeon General Rear Adm. Boris Lushniak, M.D., visited NIEHS Nov. 2 to present the National Prevention Strategy, a comprehensive plan to increase the number of Americans who are healthy at every stage of life. Lushniak is an officer in the U.S. Public Health Service (USPHS) Commissioned Corps, which includes more than 6,500 active duty public health professionals.

"It was an honor to have Rear Adm. Lushniak visit NIEHS and RTP," explained NIEHS Chief of Staff Cmdr. Paul Jung, M.D., also an officer in the USPHS. "His visit is timely, as prevention and public health will be prominent in our Institute's upcoming strategic plan."



Duke researchers collected water samples from wells near fracking sites. (Photo courtesy of Robert Jackson)

Looking at the big picture of public health

In his talk, Lushniak explained the importance of prevention in the public health model. Typically there is a causal pathway that leads to disease and a place in that pathway where public health professionals can intervene to ensure that the endpoints, disease or injury, are never reached. One key issue is how to get the public involved.

“We have to be able to educate our citizens,” stressed Lushniak. “It is not just an issue of health disparity or health literacy, but it is imperative to get each individual involved in their own health and in taking responsibility for the decisions they make.”

According to Lushniak, another cornerstone for prevention activities is the use of public health surveillance, to include the ongoing systematic collection, analysis, and interpretation of health related data. He also described the importance of creating an information loop of public health surveillance, and making sure the information collected is directly connected to the people who are responsible for implementing prevention and control.

“We need to not just identify the problem, but what are we going to do about it,” explained Lushniak.

Changing our focus to prevention

Called for under the Affordable Care Act, the National Prevention Strategy was put together by the National Prevention, Health Promotion, and Public Health Council (National Prevention Council) and released in June 2011. The Council is composed of 17 federal agencies and is chaired by U.S. Surgeon General Regina Benjamin.



Linked video:
[Watch the June 2011 announcement of the National Prevention Strategy by HHS Secretary Sebelius and U.S. Surgeon General Regina M. Benjamin \(42:26\)](#)

(Launches in new window)

Download Media Player:  Flash [E](#)

The plan’s vision is “Working together to improve the health and quality of life for individuals, families, and communities, by moving the nation from a focus on sickness and disease to one based on prevention and wellness.”

“Do we have a healthcare system or a sick care system?” asked Lushniak, who pointed out that 18-20 percent of our gross domestic product goes to health care. Lushniak maintained that our focus needs to be on prevention, instead of only treating the end result.



Appointed U.S. Deputy Surgeon General in 2010, Lushniak began his talk by commenting on the incredible diversity of public health programs at NIEHS and congratulating the Institute on a job well done. (Photo courtesy of Steve McCaw)



NIEHS/NTP Director Linda Birnbaum, Ph.D., is surrounded by the men and women of the USPHS, including Rear Adm. William Stokes, D.V.M., executive director of the Interagency Coordinating Committee on the Validation of Alternative Methods. (Photo courtesy of Steve McCaw)

Getting to the next step

“The easy part [of creating the National Prevention Strategy] is over,” concluded Lushniak. He identified that implementing the strategy will be a much bigger task, especially in difficult fiscal times. One of the strategy’s objectives is to provide recommendations, and also outline a way to divide up actions between private and public partners. Lushniak explained that these partners can then work together to help implement the strategy at the national, state, tribal, and local levels.

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



Lushniak's visit included a meeting with many North Carolina-based USPHS Corps members. (Photo courtesy of Steve McCaw)

Key elements of the National Prevention Strategy

The National Prevention Strategy identifies four Strategic Directions and seven targeted Priorities. The Strategic Directions provide a strong foundation for all of the nation’s prevention efforts and include core recommendations necessary to build a more prevention-oriented society.

The Strategic Directions are:

- Healthy and Safe Community Environments: Create, sustain, and recognize communities that promote health and wellness through prevention.
- Clinical and Community Preventive Services: Ensure that prevention-focused health care and community prevention efforts are available, integrated, and mutually reinforcing.
- Empowered People: Support people in making healthy choices.
- Elimination of Health Disparities: Eliminate disparities, improving the quality of life for all Americans.

The seven Priorities are:

- Tobacco Free Living
- Preventing Drug Abuse and Excessive Alcohol Use
- Healthy Eating
- Active Living
- Injury and Violence Free Living
- Reproductive and Sexual Health
- Mental and Emotional Well-Being

More information about the National Prevention Strategy and the National Prevention Council can be found at: <http://www.healthcare.gov/prevention/nphpphc/index.html>.

NIEHS hosts Pan American Health Organization meeting

By Ernie Hood

Global environmental health is a key focal area for NIEHS, and the Institute's involvement in the area took a significant step forward when it played host Oct. 24-26 to a multinational group of health and environment experts. The event was a regional meeting of the World Health Organization/Pan American Health Organization (WHO/PAHO) Collaborating Centers in the area of [Sustainable Development and Environmental Health \(SDE\)](#).

The gathering was held in anticipation of a landmark event known as Rio+20 — the [U.N. Conference on Sustainable Development](#) to be held June 4-6, 2012, in Rio de Janeiro.

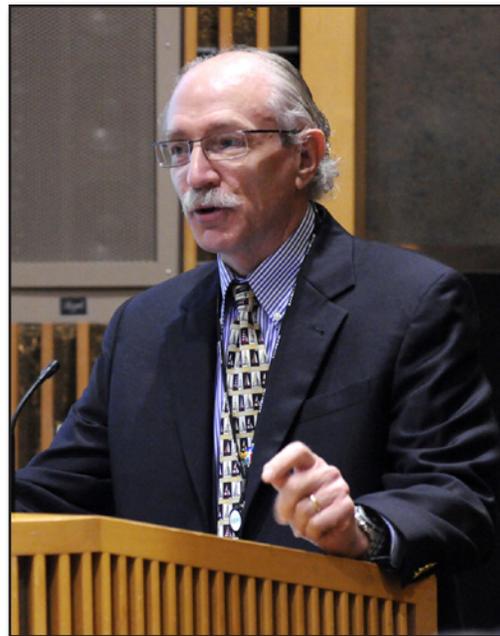
Co-moderated by John Balbus, M.D., NIEHS senior advisor for public health, the Research Triangle Park, N.C., meeting provided a unique opportunity for NIEHS scientists to interact with colleagues from throughout the Americas, raising mutual awareness and engagement on issues related to global health, the environment, and sustainable development.

Looking forward to Rio+20

The first day of the meeting was devoted to a workshop on health and sustainable development, featuring sessions on Rio+20; environmental, occupational, and urban challenges; the social environment; and development and health. Participants from the WHO/PAHO Collaborating Centers then broke out into six working groups, in particular topic areas, to prepare specific input to the Rio+20 conference, and to plan PAHO's activities for the next two years.

The balance of the meeting's final day was devoted to PAHO and NIEHS attendees getting acquainted, beginning with an overview of NIEHS and the National Toxicology Program (NTP) by Director Linda Birnbaum, Ph.D., followed by a set of informal meetings between NIEHS scientists and PAHO visitors to compare notes and discuss collaborative opportunities in several specific topic areas, including children's health. The meeting's final event was a tour of NIEHS facilities.

As PAHO Senior Advisor on Risk Assessment and Global Environmental Change Carlos Corvalan, Ph.D., pointed out, NIEHS and WHO have had a long-standing working relationship, but the chance



NIEHS Deputy Director Rick Woychik, Ph.D., welcomed the international visitors to NIEHS and Research Triangle Park, N.C. (Photo courtesy of Steve McCaw)

NIEHS as a WHO/PAHO Collaborating Center

According to Balbus, the Institute, as part of its global health agenda, is very interested in re-establishing its role as a WHO/PAHO Collaborating Center, as it was in the 1980s. In that context, he noted, NIEHS had several goals in mind for hosting the meeting. Balbus said, "One was just to become acquainted with the PAHO Collaborating Center network, to introduce ourselves, and let them understand what we do. Another aim was simply to observe their process, so as we work on our application, we understand how the Collaborating Centers work and can best see how we fit in with that. And then the third goal involved making plans for working together with PAHO to translate various aspects of our science that have implications for sustainable development. We hope to get that information into the discussion that's going on globally about sustainable development, which tends to neglect the importance of environmental health."

to meet face-to-face is bound to enhance cooperation and collaboration. “Having the event here was a good opportunity for NIEHS to know about what we do and how we work with our centers,” he said. “And for us, and for the centers that came here, I would say probably none of them have ever visited NIEHS, so it was very impressive for them.”

According to Luiz Augusto Cassanha Galvao, M.D., PAHO SDE manager, there were solid reasons for holding the meeting at NIEHS. “Most of the groups that are here work on occupational health and environmental health, so they know NIEHS very well, but most of them have never had the chance to come here to meet their colleagues and talk to them,” he said.

“The other motivation to having the meeting here was the coincidence of interests,” he continued. “We are all facing new challenges, such as the challenge of integration between chemicals and the environment, and the social environment and development, along with nutrition and noncommunicable diseases. We said, why not sit together and do something with our centers?”



Maria Neira, M.D., director of the WHO Department of Public Health and Environment, addressed meeting participants with a video message, sharing her thoughts about the conference and sending her regrets at being unable to attend in person. (Photo courtesy of Steve McCaw)



Interpreters used an isolation booth to translate the PAHO meeting proceedings into Spanish and English in real time. (Photo courtesy of Steve McCaw)



Galvao was among the PAHO SDE leaders who addressed the Collaborating Centers Regional Meeting, as it accomplished much business in its biennial gathering. (Photo courtesy of Steve McCaw)



Representatives from PAHO SDE Collaborating Centers throughout North, Central, and South America attended the regional meeting. (Photo courtesy of Steve McCaw)



Balbus chaired the meeting session on environmental, occupational, and health challenges. (Photo courtesy of Steve McCaw)



Corvalan confers with former NIEHS/NTP senior advisor to the director Christopher Portier, Ph.D., who is now director of the National Center for Environmental Health and Agency for Toxic Substances and Disease Registry at the Centers for Disease Control and Prevention. Portier was on hand to speak to the PAHO meeting about risk assessment and environmental hazards. (Photo courtesy of Steve McCaw)



As Birnbaum, along with NIEHS leaders and grantees earlier in the program, demonstrated, NIEHS programs can serve as a model for WHO/PAHO efforts toward sustainable development. (Photo courtesy of Steve McCaw)



Meeting participants joined Birnbaum and Balbus, center front, for an outdoor group portrait, on a lovely autumn day in North Carolina. (Photo courtesy of Steve McCaw)

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

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NIEHS fellow departs for UNC career development role

By Emily Zhou

Finding the perfect career is an exciting, often stressful process. Students need to know what career options are there, what strengths and weaknesses they have, and what skills are needed to land their dream job. In her new position at the University of North Carolina at Chapel Hill (UNC) School of Medicine's Office of Science, Training, and Diversity, Erin Hopper, Ph.D., will help guide graduate students in this process of exploration and career development.

Hopper will actually have dual roles at UNC. As director of the Training Initiatives in Biomedical and Biological Sciences (TIBBS), Hopper will devote half of her time to running programs and workshops for professional development, including organizing speakers for UNC graduate students. For the other half of her time, as assistant director of the Academic and Career Excellence Program, Hopper will focus on academic coaching, such as preparing qualifying exams, and student support. Also, Hopper will be involved in promoting diversity activities and education outreach events, such as DNA Day.

Hopper, who departed NIEHS in early November for her new appointment, was a postdoctoral fellow with [Kenneth Tomer, Ph.D.](#), in the Laboratory of Structural Biology. In addition to her research role, Hopper was involved with more than 10 NIEHS Trainees Assembly (NTA) subcommittees charged with the coordination of events, including the career fair.

She said of Tomer, "I felt so fortunate that my advisor gave me the freedom to be actively involved in the NTA steering committee and career fair planning committee, both of which were crucial to getting the job I wanted."

Laying the groundwork for a future career

Early in graduate school at Duke University, Hopper realized that she would enjoy a career involving science, but away from the bench. She was involved in many activities on campus at Duke, including being on the planning committee for Women in Science and Engineering, which implements professional development seminars, workshops, and panel discussions for graduate students. "It was an eye-opener that there were so many job options for Ph.D.'s, other than just academia and industry," she commented.

At the same time, Hopper identified her passion for mentoring. She mentored undergraduate students and summer research students with their science projects, and provided advice on career options and graduate school applications. In particular, Hopper was adept at facilitating faculty-student relationships, working closely with the faculty to meet students' educational needs.



Hopper was very sad to leave NIEHS, in particular the NTA steering committee. "My involvement with the steering committee gave me a tremendous amount of satisfaction, and I will miss all of them more than they can imagine," she said. "I would like to thank them all for their support and for everything they do to support the trainees at NIEHS. They are wonderful scientists and friends, and I wish them all happy and fulfilling careers." (Photo courtesy of Steve McCaw)

An NIEHS postdoctoral fellow wearing many different hats

Networking, needless to say, was also a component in successfully launching her new career. The hiring manager for the UNC job was Patrick Brandt, Ph.D., who was also an NIEHS trainee. In addition, Pat Phelps, Ph.D., deputy director of the Graduate Partnerships Program in the NIH Office of Intramural Training and Education, was a great help in coaching her on interview skills. “Pat asked many questions that the interviewing committee later asked me.” Being the person who started TIBBS at UNC, Phelps knew exactly what they were looking for in a candidate.

Writing was also a very important skill that Hopper developed at NIEHS, as a contributing writer for the Environmental Factor. “In general, writing and being able to communicate to a broad audience are extremely important for any job.” She will advocate and encourage UNC graduate students to be more involved in their writing.

(Emily Zhou, Ph.D., is a research fellow in the NIEHS Laboratory of Signal Transduction Inositol Signaling Group.)

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American Chemical Society honors newsletter intern

By Eddy Ball

Environmental Factor intern and North Carolina Central University (NCCU) student Melissa Kerr is the winner of the 2011 Undergraduate Award in Analytical Chemistry. The award is presented jointly, each year, by the American Chemical Society Division of Analytical Chemistry (ACS-DAC) and the journal Analytical Chemistry to one outstanding student at each eligible institution.

In Kerr’s notification letter, ACS-DAC Undergraduate Award Committee Chairman Douglas Beussman congratulated her and wrote, “This award recognizes your outstanding efforts in the area of analytical chemistry.” Currently a junior at NCCU, Kerr has maintained a 3.9 grade point average during her first two years of chemistry coursework.

From liberal arts to analytical chemistry

That Kerr is doing so well in analytical chemistry is not surprising — the fact that she is studying chemistry as a non-traditional student is. Kerr holds two bachelor degrees, one in Japanese studies from the University of Iowa and one in psychology from Buena Vista University.



Reflecting on her last two years of study, Kerr said, “I am more excited about my prospects now than I have ever been. I can’t wait to get started.” (Photo courtesy of Steve McCaw)

After working with people with mental illness and developmental disabilities for three years, Kerr and her husband moved from Iowa to Chapel Hill, N.C. Once she settled into her new community and her new job here with a day services program for people with developmental disabilities, Kerr says her interest in science gradually drew her back to the classroom, where she is a decade or more older than her traditional counterparts.

Although she maintains a heavy load of courses and works full time, Kerr decided she also wanted to get writing experience and took on an internship with the NIEHS monthly newsletter in the fall of 2010. She followed a lead from her mentor, NCCU organic chemistry professor John Myers, Ph.D. Over the past year, Kerr has contributed an article or two each month to the Environmental Factor.

Looking toward careers

One of the benefits of writing for the newsletter, Kerr said, is exposure to NIEHS students' and fellows' career development programs. "I've written stories about the [NIH Summer Internship Program], and I wrote one about the Quintiles Open House last summer," she said. "I've also heard many eye-opening stories about how people ended up where they did in scientific careers."

Kerr's own career direction is still uncertain, but she's getting a scientific education, learning about science supported by NIEHS, and building a portfolio of writing samples. "I'm not sure, yet, where I'll end up," she observes, "but I think it's going to be fun getting there."

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Annual APHA conference celebrates 100 years of environmental health

By Ian Thomas

Scientists, administrators, and public health officials gathered at the Walter E. Washington Convention Center in Washington, D.C., for the 139th American Public Health Association (APHA) Annual Meeting and Exposition. In addition to a host of presentations and posters ([see text box](#)), NIEHS helped mark the 100th anniversary of APHA's [Environment Section](#), one of the oldest of the 27 sections in the association.



Linked video:
[Watch "Environment. Health. You." a video produced by the APHA Environment Section in honor of its 100-year anniversary. \(12:39\)](#)

(Launches in new window)

Download Media Player:  Flash [↗](#)



According to Dearry, the APHA Environment Section has become a model for advocating the green meeting concept, particularly at the APHA annual meeting. "By using Facebook, Twitter, and an electronic version of our newsletter, we were able to disseminate all the same information to just as many people, while only using a fraction of the paper. We also tried to discourage the use of plastics by handing out stainless steel water bottles to the meeting's attendees." (Photo courtesy of Steve McCaw)

"We actually started planning this centennial celebration more than two years ago," said NIEHS Senior Advisor Allen Dearry, Ph.D., a 15-year member of APHA and the Environment Section's former chair. "We wanted to create a program that not only reflected its achievements within the public health arena, but also gave a detailed account of where the section came from and where it is today."

Evolving with the times

Originally founded in 1911 as APHA's Engineering Section, the group's original mission was reflective of its name.

"If you look at what was happening in the early 20th century, there was a lot of developmental emphasis on basic infrastructure," Dearry explained. "Housing, sanitation, land usage, water quality — these were major issues back then, just as they are today, and, in many ways, they became the origin for both the Environment Section, as well as the environmental health field itself."

Eventually becoming the Environment Section in 1970, its mission has evolved to helping shape policy, by enhancing research and public awareness of environmentally influenced disease, fostering alliances with like-minded organizations, and monitoring all relevant science and policy pertaining to the field of environmental health.

"The built environment is one area where I feel we've really made strides in my time with the section," Dearry noted of the field that is dedicated to studying the planning and construction of communities, homes, and workplaces, and how these factors influence human health. "We spend nearly 80 percent of our time in these structures. So when it comes to issues like indoor air quality, the need for research is clear, and this section has contributed a great deal to our understanding of that area."



The NIEHS exhibit received best-in-show honors for overall appearance and visitor communication effectiveness. Pictured, left to right, are Dana McNally, graphic designer and contractor for Environmental Health Perspectives (EHP); Christine Flowers, NIEHS director of communications; Bono Sen, Ph.D., EHP science education and outreach program manager; and Rita Hanson, EHP managing editor. (Photo courtesy of Chip Hughes)

Back to the future: reuniting environmental health

In support of the "Healthy Communities Promote Healthy Minds and Bodies" theme of the 139th annual meeting of APHA, NIEHS Senior Advisor for Public Health John Balbus, M.D., organized a distinguished panel of leading experts to discuss past approaches and future opportunities in environmental and occupational health.

- NIEHS/NTP Director Linda Birnbaum, Ph.D., presented the current state of research on immunotoxic properties of chemicals, including interactions between chemical exposures and infectious diseases.
- Ellen Silbergeld, Ph.D., an NIEHS grantee with the Johns Hopkins School of Public Health, spoke on antimicrobial resistance genes as environmental pollutants.
- Christopher Portier, Ph.D., former NIEHS senior advisor and now director of the National Center for Environmental Health and Agency for Toxic Substances and Disease Registry at the Centers for Disease Control and Prevention, described environmental public health tracking to prevent morbidity and mortality.
- David Michaels, Ph.D., Assistant Secretary of Labor for Occupational Safety and Health at the U.S. Department of Labor, discussed current federal efforts to better coordinate and integrate environmental and occupational program activities. Michaels is also chair of the NTP Executive Committee.

Thinking about the future

“This year, we wanted to create a theme that commemorated the section’s past, and looked ahead to both its future and the future of our field,” Dearry added. “As environmental health professionals, what are the opportunities facing us in the days and years ahead? Moreover, who will tackle those challenges? That’s why it’s up to us to educate people as best we can, and engage new students and prospective new members of the field to get involved now, so that we can face these issues together moving forward.”

(Ian Thomas is a public affairs specialist for the NIEHS Office of Communications & Public Liaison.)

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NIEHS grantee student honored with Wetterhahn Award

By Rebecca Wilson

Monica Ramirez-Andreotta is the fourteenth recipient of the annual Karen Wetterhahn Memorial Award. The award, which recognizes an outstanding graduate or postdoctoral researcher who demonstrates scientific excellence, was presented at the NIEHS Superfund Research Program (SRP) annual meeting Oct. 25 in Lexington, Ky. Ramirez-Andreotta is credited for her commitment to engaging residents of the local community in her research and empowering them with her results.

Ramirez-Andreotta is a doctoral student under the guidance of NIEHS grantee Raina Maier, Ph.D., in the College of Agriculture and Life Sciences at the University of Arizona (UA). Upon completion of her master’s degree at Columbia University, Ramirez-Andreotta took a position as the Research Translation Coordinator within UA’s SRP center.

As the coordinator, she was particularly active in building partnerships with U.S. and Mexican government agencies, creating Web-based and other innovative bilingual communication tools, and participating in local community events.

Currently, Ramirez-Andreotta is undertaking several projects, one of which she has named Gardenroots. In this project, she is conducting research to understand how metals are being taken up by vegetables planted in home gardens adjacent to the Iron King Mine and Humboldt Smelter Superfund site in Dewey-Humboldt, Ariz. In addition to teaming up with local gardeners to collect samples, she is also conducting a controlled laboratory study evaluating vegetable uptake in a greenhouse setting. The final part of her project aims to develop effective ways of communicating project results to the Dewey-Humboldt community.

As the awardee, Ramirez-Andreotta will receive support to attend a major scientific conference, in addition to travel funds to attend next year’s SRP annual meeting where she will present her research.

(Rebecca Wilson is an environmental health information specialist with MDB, Inc., a contractor for the NIEHS Division of Extramural Research and Training SRP.)



Bill Suk, Ph.D., director of the NIEHS SRP, congratulates Ramirez-Andreotta at the recent SRP annual meeting. (Photo courtesy of Joseph Rey Au)

Remembering Karen Wetterhahn

Karen Wetterhahn, Ph.D., was professor of chemistry at Dartmouth College and an established authority on the effects of heavy metals on biological systems. As a dedicated teacher and mentor, she played an integral role in the administration of the sciences at Dartmouth and served as the program director of the Dartmouth College Superfund Research Program from 1995 to 1997.

In addition to overseeing the program, she studied the effects of toxic heavy metals on cellular processes. An acknowledged international expert in chromium carcinogenicity, Wetterhahn was a leader in conducting research on how metals initiate cancer and other metal-induced human diseases at the molecular level. She fostered links between biology, chemistry, environmental studies, engineering, and the medical school. “The life sciences are interdisciplinary,” Wetterhahn insisted.

Wetterhahn died on June 8, 1997 at age 48, as the result of dimethylmercury poisoning caused by the accidental spill of a few drops of the chemical on her latex glove-covered hand.

As a way of honoring the life and scientific accomplishments of Wetterhahn, the SRP has established an annual award to recognize an outstanding graduate student or postdoctoral researcher who best demonstrates the qualities of scientific excellence exhibited by Wetterhahn.

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NIEHS expands minority outreach at fall conferences

NIEHS joined the ranks of other agencies and private companies to encourage Hispanic/Chicano and Native American students to pursue higher education and obtain advanced degrees. Ericka Reid, Ph.D., from the NIEHS Office of Science Education and Diversity and postdoctoral fellow Anshul Pandya, Ph.D., from the Laboratory of Neurobiology, represented the Institute Oct. 27-30 at the Society for Advancement of Chicanos and Native Americans in Science (SACNAS) National Conference. The 2011 conference, titled “Empowering Innovation and Synergy Through Diversity,” was held in San Jose, Calif., and attracted talented students from around the country.



For more than 30 years, SACNAS has been encouraging Hispanic/Chicano and Native American students to pursue science research, leadership, and teaching careers at all levels. SACNAS was named the National Science Board's premier minority science organization promoting diversity in science careers, and was the winner of the 2004 Presidential Award for Excellence in Science, Mathematics, and Engineering Mentoring.

Connecting with young scientists

With more than 3,600 students in attendance, NIEHS was able to focus on its goals of recruitment and outreach. NIEHS' booth in the exhibition section of the conference was frequented by students looking for future opportunities in science research, including internships and fellowships.

“It is a rewarding experience for me to talk to young students of minority backgrounds,” said Reid, who is working to enhance NIEHS’ education and diversity outreach. “The [NIH] Summer Internship Program was a popular topic, and I’m hopeful that interest will translate into an increase in the number of applicants from different states.”

At a higher level, graduate students and Ph.D. candidates inquired about the opportunities available at NIEHS. “Being a postdoctoral fellow, I was asked about my personal experience of working at the NIEHS,” accounted Pandya, who was attending his first conference in an outreach and diversity capacity. “There was a misconception among a lot of students that, as its name suggests, NIEHS was involved only in environmental research. Events like the SACNAS conference enable us to convey our Institute’s robust health and biomedical science research.”

“Those who visited the NIEHS booth were also told about the exciting research being carried out in the intramural division of the NIEHS, and the funding opportunities and grants available through the NIEHS,” Pandya added.

Following the SACNAS conference, Reid’s travels took her to St. Louis Nov. 9-12 for the Annual Biomedical Research Conference for Minority Students on November 9-12. There, she was joined by Danielle Watt, Ph.D., an Intramural Research Training Award (IRTA) fellow in the NIEHS DNA Replication Fidelity Group. “Meeting students face-to-face not only increases the public profile of the Institute, but it also spreads awareness about government-funded environmental and health research,” said Reid.



In addition to raising awareness about NIEHS research training opportunities, Reid’s Office of Science Education and Diversity handles the director’s national community forum series, as well as information sessions and facility tours. (Photo courtesy of Steve McCaw)



Pandya, an IRTA fellow in the NIEHS Ion Channel Physiology Group, enjoyed his first conference in an outreach and recruitment role, and helped provide insights into NIEHS career and research opportunities. (Photo courtesy of Steve McCaw)

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Hughes honored for worker training efforts

By Ian Thomas

NIEHS Worker Education and Training Program (WETP) Director Chip Hughes was recognized by the National Council for Occupational Safety and Health (COSH) with the prestigious Tony Mazzocchi Award for his work in developing environmental health education programs for people in high-risk occupations and communities. Presented at this year's [National Worker Health and Safety Training Conference and Summit](#) Oct. 28-29 in Baltimore, the award recognizes excellence on the part of those who promote the health and safety rights of workers.

"It truly is an honor to receive this award," Hughes said. "Ultimately, worker training and education is all about giving people the tools that they need to lead healthier lives, and I feel so very fortunate to have made my career contributing to such a noble cause."

In addition to his many achievements in worker education and training, Hughes has also been instrumental in coordinating the federal government's response during several national disasters, among them 9/11, Hurricane Katrina, and the Gulf oil spill.

"This award is a direct reflection of the incredible work that Chip and the WETP staff are doing," said NIEHS/NTP Director Linda Birnbaum, Ph.D. "His dedication and wealth of experience in leveraging federal resources have resulted in safer and healthier workers."

A graduate of the University of North Carolina at Chapel Hill, Hughes joined WETP in 1990 with an extensive background in worker training and environmental justice.

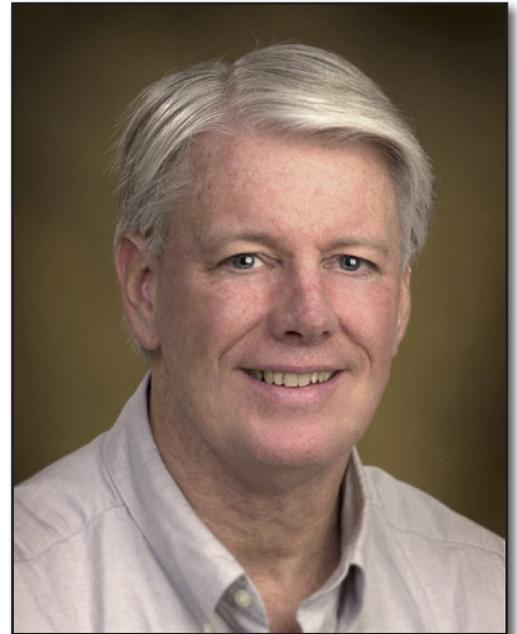
"I first met Chip back in 1993 when he and his staff were working to help get the [U.S.] Department of Energy's (DOE) Nuclear Worker Training Program off the ground," recalled Deborah Weinstock, the director of the National Clearinghouse for Worker Safety and Health Training who introduced Hughes for the award. "I was working with DOE at the time and, back then, I could never have imagined that, twenty years later, we'd still be working together."

Having long since established himself as a governmental fixture in the environmental justice arena, Hughes has never wavered in his belief that the community's best interests, and those of its workers, should always come first.

"Chip has always been a firm believer in giving the communities affected by these disasters a voice in the response and cleanup process," Weinstock explained. "For that reason, he also believes in leveraging federal resources, by partnering with other agencies, to get things done."

Formed in 1972, the [National COSH](#) is a private, non-profit coalition of labor unions, health and technical professionals, and others interested in promoting and advocating for worker health and safety. At present, there are 21 COSH groups around the country.

(Ian Thomas is a public affairs specialist for the NIEHS Office of Communications and Public Liaison.)



Hughes was among the first to be on the scene during 9/11, Hurricane Katrina, the Gulf oil spill, and numerous other national disasters, promoting the safety and well-being of workers and responders. (Photo courtesy of Steve McCaw)

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SRP grantees gather in Lexington for annual meeting

By Rebecca Wilson

At the NIEHS Superfund Research Program (SRP) annual meeting, more than 250 researchers, trainees, and colleagues gathered in Lexington, Ky., Oct 24-25 to share the latest in research and technology advances. The meeting featured the talents of veteran and trainee SRP researchers, who were able to communicate their findings and learn from others' efforts.

The scientific sessions, on topics ranging from systemic impacts of pollutants on humans to sustainable remediation techniques, were flanked with satellite meetings on the days before and after the main meeting. Researchers, who have received research project (R01) grants, gathered the day before to update program staff and their fellow researchers on their work in nanotechnology and phytoremediation. After the main session, Research Translation and Community Engagement Core leaders gathered to learn more about risk communication and strategies for interacting with the media, and effectively communicating the results of their research.



Meeting attendees received a call to the post by a bugler from Keeneland, one of Kentucky's historic racetracks. (Photo courtesy Joseph Rey Au)

Trainees taste life beyond the bench

The meeting also showcased the program's commitment to training graduate and postdoctoral researchers in cross-disciplinary research that is at the heart of the SRP strategic plan. Three sessions featured presentations by trainees and postdoctoral researchers and, at the end of each session, a Research Translation Core leader summarized the implication of the presenters' work for research translation and community engagement.

In addition to presentations, trainees were invited to participate in a panel discussion featuring NIEHS/NTP Director Linda Birnbaum, Ph.D., and other professionals from academia and industry. Trainees were able to talk about their careers and learn that there is life beyond the bench ([see story](#)).

The meeting wrapped up with awards given to several trainees. Monica Ramirez-Andreotta, Ph.D., of the University of Arizona, was named the winner of the 14th annual Karen Wetterhahn Memorial Award ([see story](#)).

Six students also received prizes for their efforts in the annual student poster contest. In the non-biomedical poster session, the winners were Corin Hammond, University of Arizona SRP Center; Dena Cologgi, Michigan State University; and Richard Meggo, University of Iowa SRP Center. In the biomedical category, Fabian Grimm, University of Iowa SRP Center; Lauren Tetz, University of Michigan-Northeastern University SRP Center; and Bei Zhang, University of Kentucky SRP Center, were awarded top places.

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

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Teachers visit NIEHS for science literacy workshop

By Darshini Trivedi

With today's rapidly emerging technologies and new scientific issues, K-12 educators are more challenged than ever to prepare themselves and their students for the future. To help bridge the knowledge gap, NIEHS played host to the North Carolina Association for Biomedical Research (NCABR) Nov. 10 for a science literacy workshop. The daylong event, which brought teachers from across the state, provided an overview of the biomedical research process based on NCABR's comprehensive Rx for Science Literacy curriculum manual (see text box).

NCABR is a statewide nonprofit organization dedicated to advancing the public's appreciation for biomedical research. Since its founding in 1989, NCABR has launched several science education and outreach programs such as the Rx for Science Literacy workshop series, which has helped teach 3,600 educators from 94 of North Carolina's 100 counties about the latest in science. At the workshops, educators tour a research facility, hear from scientists about their latest research advances, and take home a free curriculum and other bioscience education materials.

The what, where, how, and why of health science research

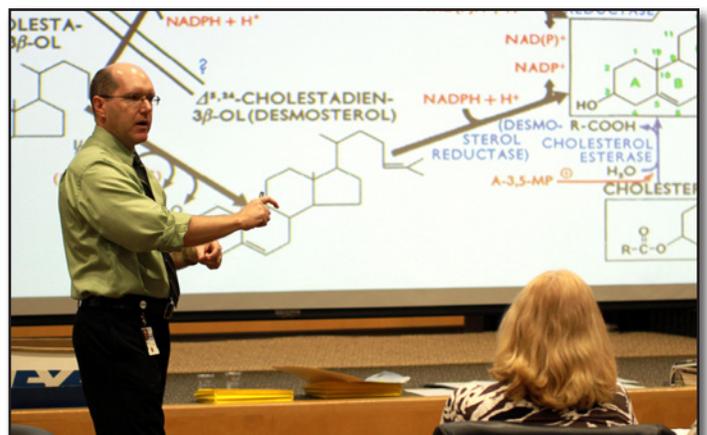
Ericka Reid, Ph.D., and John Schelp, from the NIEHS Office of Science Education and Diversity, took the lead in organizing the workshop that drew speakers from around the Institute. The day began with welcoming remarks from Sharon Beard, an industrial hygienist with the Worker Education and Training Program at NIEHS.

Michael Humble, Ph.D., a health scientist administrator in the Cellular, Organs, and Systems Pathobiology Branch, gave an overview of the curriculum, which included several lesson plans about science and biomedical research, as well as classroom activities designed to promote creativity and critical thinking.

Next, a presentation on the humane use of animals in environmental health research was delivered by Terry Blankenship-Paris, D.V.M., head of the Comparative Medicine Branch. Blankenship-Paris



As opening speaker, Beard welcomed teachers from across the state to NIEHS. (Photo courtesy of Michael Garske)



Humble guided teachers through the Rx for Science Literacy curriculum, as well as some hands-on activities. (Photo courtesy of Michael Garske)



Blankenship-Paris noted the important contribution of animal models to biomedical research progress. (Photo courtesy of Michael Garske)

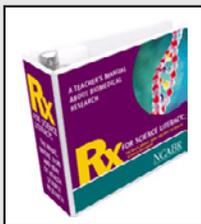
emphasized the importance of the use of animals in research, by giving examples of historical contributions of animal models to medical progress. She also noted that 96 percent of animals used in research today are rats and mice, and that the care and use of animals in research is governed by extensive federal regulations.

The remainder of the program included presentations on breast cancer and the environment by Les Reinlib, Ph.D., a program administrator in the Susceptibility and Population Health Branch, and toxicogenomics by Rick Paules, Ph.D., a senior scientist in the Laboratory of Toxicology and Pharmacology.

NCABR members will return to NIEHS June 19, 2012, for a workshop titled “Chemicals, the Environment, and You.” This session will focus on the science of toxicology, to help teachers and students understand the relationship between chemicals in the environment and human health. It also conveys the influence of chemicals on the health of living organisms.

(Darshini Trivedi, Ph.D., is a postdoctoral fellow in the NIEHS Metabolism and Molecular Mechanisms Group.)

Rx for Science Literacy: The What, Where, How and Why of Health Science Research



Targeted to K-12 educators, the Rx for Science Literacy curriculum manual explains the biomedical research process, the benefits of biomedical research to humans and animals, and the care and use of animals in medical science.

The 300-page manual contains resource materials for in-class use, including handouts, lesson plans, and activities to assist teachers. Topics covered include:

- Processes and benefits of biomedical research
- Careers and ethical issues in medical science
- Information for teachers of health occupations that explains how the manual corresponds to the National Healthcare Skill Standards

The manual has been selected by the N.C. Department of Public Instruction as the primary curriculum for its biomedical technology course, and has been continuously updated and expanded since its initial launch in 1994.



Reinlib discussed the latest findings pertaining to environmental factors related to breast cancer. (Photo courtesy of Michael Garske)



A highlight of the day was the tour of the NIEHS facilities. After seeing the high-tech equipment used for research, one of the teachers said, “I am absolutely amazed by everything!” (Photo courtesy of Michael Garske)

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Science Notebook

Panel peer reviews NTP low-level lead draft

By Robin Mackar

A nine-member independent peer review panel, convened by the National Toxicology Program (NTP), reviewed the [Draft NTP Monograph on Health Effects of Low-level Lead](#) Nov. 17-18 at NIEHS.

The panel concurred with the overall NTP conclusion that “there is sufficient evidence for adverse health effects in children and adults at blood Pb [lead] levels below 10µg/dL [micrograms per deciliter] and below 5 µg/dL as well.”

The monograph is the result of an extensive review of the current scientific literature by the [NTP Office of Health Assessment and Translation \(OHAT\)](#), formerly the Center for the Evaluation of Risks to Human Reproduction, in response to a nomination by the National Institute for Occupational Safety and Health (NIOSH) for an NTP evaluation to assess the reproductive and developmental effects of lead exposures. OHAT expanded the scope of the evaluation to include a wider range of health effects, including cardiovascular, renal, immune, and neurological effects in children and adults, to maximize the utility of the evaluation and reflect OHAT’s more broad-based focus on health assessment.

The draft monograph was released for public comment on Oct. 14. Public commenters were given time to present at the meeting, before OHAT health scientists gave brief presentations on the basis for the NTP conclusions for specific health effects of lead, and summary conclusions for each health area.

The panel accepted and agreed with the NTP summary conclusions for associations of cardiovascular, renal, and immune health outcomes with lead exposures resulting in blood lead levels below 10µg/dL. To reflect the evidence for effects at lower blood lead levels, the reviewers suggested changing the draft summary conclusions of sufficient evidence for associations with neurological effects in children, and reproductive effects in adult women, including reduced fetal growth and lower birth weight, from 10µg/dL to 5µg/dL.



Peer review panel member Guallar offered much input to the NTP on the draft monograph, and provided suggestions on how OHAT could even more systematically evaluate the literature used in their documents. (Photo courtesy of Michael Garske)



Some of the world’s most notable lead researchers, including Bruce Lanphear, M.D., senior scientist at the Child and Family Research Institute, and Pam Factor-Litvak, Ph.D., associate professor of clinical epidemiology at Columbia University Mailman School of Public Health, were members of the peer review panel who met at NIEHS to review the draft NTP monograph on health effects of low-level lead. (Photo courtesy of Michael Garske)

Regulatory and public health implications

Next, the NTP will carefully consider the peer review panel and public comments, revise the document as needed, and move forward on finalizing the monograph. The process should be completed in early 2012, when the finished monograph will be posted to the NTP website.

There will likely be public health implications, in addition to the regulatory impacts of the monograph's conclusions. For example, NIEHS/NTP Director Linda Birnbaum, Ph.D., speculated that the science emerging on the potential danger of prenatal lead exposures could result in public health action similar to advisories to women of childbearing age to avoid eating fish laden with high levels of mercury. "What I've heard today leads in the same direction for discussion about lead," she said. "I certainly know that most young women who are pregnant are not being measured for their lead levels. I think that's a message we might want to try to get out."

Panel member Eliseo Guallar, M.D., Dr.P.H., of the Johns Hopkins University Bloomberg School of Public Health, noted that although the monograph's conclusions set the lead exposure levels at which associated health effects are seen lower than ever, "we're still finding that the lower we go, we still find effects of lead, and I think we still haven't seen the end of it. This is not an area where we're done yet," Guallar predicted.

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

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ISES meeting challenges exposure science

By Ernie Hood

At the 2011 annual meeting of the International Society of Exposure Science (ISES) Oct 23-27 in Baltimore, Md., Gwen Collman, Ph.D., director of the NIEHS Division of Extramural Research and Training (DERT), and David Balshaw, Ph.D., also with DERT, highlighted a vision for exposure science and challenges for the field.



The peer review panel for the low-level lead meeting was chaired by Joel Pounds, Ph.D., of the Pacific Northwest National Laboratory. Pounds appears third from the left at the head table with Birnbaum, DNTP Director John Bucher, Ph.D., Kristina Thayer, Ph.D., director of OHAT, and Andrew Rooney, Ph.D., OHAT senior health scientist. Thayer, Rooney, and Abee Boyles, Ph.D., of OHAT made overview presentations of the NTP findings. (Photo courtesy of Michael Garske)



Epidemiologist Elizabeth Whelan, Ph.D., from NIOSH, represented her agency at the NTP meeting. The nomination for evaluating health effects of low-level lead exposures came from NIOSH. (Photo courtesy of Michael Garske)



**International Society
of Exposure Science**
Science for Better Environmental Health

Co-sponsored by NIEHS, the ISES meeting is one of the premier international exposure science events, bringing together scientists, engineers, and policy makers from a variety of disciplines, to highlight significant achievements and raise awareness for the role of exposure science in environmental health.

In her keynote address, titled “Exposure Science and Beyond: Challenges for the Future,” Collman presented the ISES attendees three grand challenges for exposure science to address as it moves forward. She called for exposure scientists to extensively characterize exposures during pregnancy; design and implement novel approaches to measure past exposures; and reduce the costs and increase the impact of exposure assessment.

She also discussed the extraordinary complexities of exposure and disease in the 21st century, and the need to shift the emphasis in exposure science to prevention, by enhancing links to public health and by making data and information freely available and accessible.

Finally, Collman pointed out the natural alignment between NIEHS and ISES. “It’s imperative that our organizations continue to work closely together as we expand and accelerate our efforts to meet the scientific challenges we face,” she said.

Balshaw was also present at the Baltimore meeting to participate in a closing plenary session panel discussion called “The Past is Prologue: Reflections on the Future of Exposure Science.” The panel, co-chaired by Debra Kaden, Ph.D., of ENVIRON and Kirk Smith, Ph.D. of the University of California, Berkeley, was based on the premise that exposure science is not used in risk assessment, designing interventions, and setting policy, as much as it should be. The group discussed some of the reasons for those shortcomings, and laid out some of the potential opportunities for translating exposure science into those domains.

“We need to focus on making exposure science relevant and achievable,” said Balshaw. “For example, there is great interest in the potential power of the exposome concept — the measure of all the exposures of an individual in a lifetime and how those exposures relate to disease. We need to develop the ability to characterize exposure comprehensively, and enable an agnostic assessment of the connections between exposure and disease.”

During the panel discussion, he proposed four areas where he felt that ISES needs to concentrate its efforts to make that concept a reality — prioritization, focusing on the most relevant environmental compounds; collaboration across disciplines within exposure science; integration through assessing multiple components of the personal environment and the interface between exposure and biological response; and innovation through new tools, capabilities, and thinking outside the box.

Next year’s ISES annual meeting will be held Oct. 28-Nov. 1, 2012 in Seattle.



Collman delivered the keynote address at this year’s annual meeting of ISES. (Photo courtesy of Steve McCaw)



Balshaw is program administrator in the DERT Center for Risk and Integrative Sciences. (Photo courtesy of Steve McCaw)

About ISES

The International Society of Exposure Science (ISES), formerly the International Society of Exposure Analysis (ISEA), was established in 1990 to foster and advance the science of exposure analysis related to environmental contaminants, both for human populations and ecosystems. The society's members include academic, governmental, and private sector scientists who have a common interest in the field of exposure science. The society actively promotes engagement and communication among all disciplines involved in exposure science through its annual meetings and scientific journal, *Journal of Exposure Science and Environmental Epidemiology*, and serves as a resource for scientists in other disciplines, governmental officials, and the public. The society endeavors to promote rigorous use of exposure science to strengthen environmental policy for the protection of public health.

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

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Wood stove intervention can reduce childhood pneumonia

By Ed Kang

Cooking stoves with chimneys can lower exposure to indoor wood smoke and reduce the rate of severe pneumonia by 30 percent in children less than 18 months of age, according to a new air pollution study funded by the National Institute of Environmental Health Sciences (NIEHS), part of the National Institutes of Health.

The study in the Nov. 10 issue of *The Lancet* showed that rates of severe childhood pneumonia were significantly reduced in households provided with a wood stove connected to a chimney, compared with homes where open, indoor wood cooking fires were used. The lead researchers at the University of California, Berkeley, report that carbon monoxide exposure levels were reduced 50 percent on average in the homes equipped with chimneys.

Though childhood deaths from pneumonia are relatively uncommon in the United States, it kills more children worldwide than any other disease, and open fires used for heating and cooking are thought to be a major cause. Pneumonia kills an estimated 1.4 million children each year.

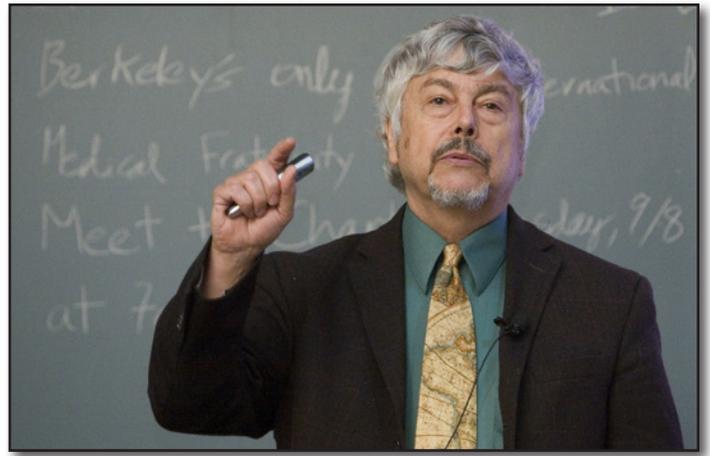
“Exposure to smoke from cooking stoves is a major global public health problem that affects nearly half of the world’s population and contributes to approximately 2 million deaths per year,” said Linda Birnbaum, Ph.D., director of NIEHS and the National Toxicology Program. “This is one of the first studies that shows how an intervention can reduce indoor air pollution from wood smoke, so people can live healthier lives.” Birnbaum noted that the paper’s



Considered the gold standard of scientific experiments, the randomized, controlled exposure study in Guatemala measured differences between open burning (top) and cookstoves with chimneys. (photo courtesy of Kirk Smith)

release also coincides with [World Pneumonia Day](#) on Nov. 12, which is geared toward raising awareness of the effects of pneumonia globally.

The NIH Randomized Exposure Study of Pollution Indoors and Respiratory Effects (RESPIRE) trial included a total of 534 households in rural Guatemala with a pregnant woman or young infant. The study participants were randomly assigned to receive a locally developed cookstove with a chimney or to continue cooking using traditional open wood fires. In all, 265 children were from the chimney-stove homes and 253 children were in the control homes. Trained field workers visited the homes every week for two years to record the children's health status. Sick children with cough and fast breathing were referred to physicians.



Smith is considered by many to be the father of the cookstove movement. He has spent decades in places such as India, China, Guatemala, and Nepal, studying the effects of biomass burning and indoor air pollution. (photo courtesy of Kirk Smith)

Although the study did not significantly reduce the total number of diagnosed childhood pneumonia cases, the reduction in severe pneumonia would likely result in reduced childhood mortality, according to the researchers.

“We found as large a benefit for severe pneumonia as more well-known public health interventions, such as vaccinations and nutrition supplements,” said Kirk Smith, Ph.D., lead researcher for the study and a professor of global environmental health at the University of California, Berkeley. “Future investments into viable, large-scale stove and fuel interventions to reduce child exposure to household air pollution are certainly worth making.”

Citation: [Smith KR](#), [McCracken JP](#), [Weber MW](#), [Hubbard A](#), [Jenny A](#), [Thompson LM](#), [Balmes J](#), [Diaz A](#), [Arana B](#), [Bruce N](#). 2011. Effect of reduction in household air pollution on childhood pneumonia in Guatemala (RESPIRE): a randomised controlled trial. *Lancet* 378(9804):1717-1726.

(Ed Kang is a public affairs specialist in the Office of Communications and Public Liaison and a regular contributor to the Environmental Factor.)

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Neurotox27 focuses on environmentally triggered disorders

By Ernie Hood

The time for characterization of the role of environmental factors in neurodevelopmental disorders has come. This was the take-home message of the 27th International Neurotoxicology Conference Oct.30-Nov. 2 at the Sheraton Imperial Hotel and Convention Center in Research Triangle Park (RTP), N.C. NIEHS and Environmental Health Perspectives were among the [sponsors](#) of the event, titled “Environmentally Triggered Neurodevelopmental Disorders: Focus on Endocrine Disruption and Sex Differences in Autism, ADHD, and Schizophrenia.”

The conference was last held in RTP in 2005, and according to NIEHS program administrator Cindy Lawler, Ph.D., ([see related story](#)) holding the conference locally boosted attendance to more than 200. “We were able to draw from the local universities, and a number of our intramural scientists came to hear the talks, as well,” she said. “The program resonates, as these are issues that NIEHS has made significant investments in — especially autism.”

Cross-discipline dialogue proves valuable

Conference co-chair Isaac Pessah, Ph.D., a professor of molecular biosciences and director of the Center for Children's Environmental Health and Disease Prevention at the University of California, Davis, found the dialogue that took place to be the meeting's greatest value. "What's unique about this meeting is that it brought this crosscutting paradigm, and I think a lot of the attendees really got a lot out of it, because you don't usually present it that way," he said. "Usually, there's an autism meeting, there's a schizophrenia meeting, there's an ADHD meeting, and they are never brought together with the questions about what are the commonalities and what are the differences."

Thomas Zoeller, Ph.D., of the University of Massachusetts Amherst, who co-chaired the plenary session on endocrine disruption in autism spectrum disorders, agreed with Pessah, and said that the flow of ideas at the meeting among scientists who don't normally talk to each other had a profound effect upon his own thinking. "I've really changed my perspective about the way that the environment might impact brain function," he said. Both he and Pessah are NIEHS grantees.

With so many topics of interest to NIEHS on the agenda, the Institute was well-represented at the conference. Serena Dudek, Ph.D., head of the NIEHS Synaptic and Developmental Plasticity Group, provided attendees with a tutorial on synaptic plasticity as a common target in neurodevelopmental disorders.

Jean Harry, Ph.D., group leader of the NTP Neurotoxicology Group, served as one of the meeting's poster session co-chairs and networking mentors, and also co-chaired a session on developmental neurotoxicology mechanisms. Mamta Behl, Ph.D., and Christopher McPherson, both of whom work with Harry, were recognized at the meeting with a postdoc presenter award and graduate student poster award, respectively.

Also, David Goulding, of the Comparative Medicine Branch, presented a poster on his work with Harry on neurobehavioral phenotyping of mice. Harry's former student Steven Szabo, M.D., Ph.D., who is now a psychiatry resident at Duke University, also gave a platform presentation and presented a poster based on his work with Harry on the potential therapeutic benefits of lithium for trimethyltin neurotoxicity.

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



Opening the meeting's plenary sessions, Pessah presented the overview and rationale for the theme of the conference, which was designed to present attendees with the latest state of the science about the role of the endocrine system in environmentally triggered disorders. (Photo courtesy of Steve McCaw)



Division of Extramural Research and Training Health Scientist Administrator Annette Kirshner, Ph.D., paid close attention to the scientific presentations on neurodevelopmental disorders, which comprise part of the grants portfolio she administers. (Photo courtesy of Steve McCaw)



Neurotox27 was well attended, as participants made their way to RTP to enjoy the many scientific presentations and discussions. (Photo courtesy of Steve McCaw)

Colborn honored

One of the meeting's highlights was the presentation of the [Theo Colborn Award](#), to Colborn herself, by NIEHS/NTP Director Linda Birnbaum. Colborn, who in 1996 co-authored the seminal text "Our Stolen Future," was honored for her role as a pioneer in research on endocrine disrupting chemicals believed to interfere with hormonal development. She is the founder and president of [The Endocrine Disruption Exchange \(TEDX\)](#), the only environmental organization that focuses on the problems associated with endocrine disruption attributable to synthetic chemicals found in the general environment.

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A conversation on the state of autism research

By Ernie Hood

At the International Neurotoxicology Conference Oct. 30-Nov. 2 ([see related story](#)), the Environmental Factor sat down for an in-depth interview with Health Science Administrator Cindy Lawler, Ph.D., of the NIEHS Division of Extramural Research and Training. Lawler leads a portfolio of autism-related research, and she shared her thoughts about the meeting and the state of the science.

The Factor: The content of this meeting seems to fit in well with the NIEHS mission and current research portfolio.

Lawler: "I think it does. We have had a very healthy investment in neurodevelopmental toxicology for many years, but environmental insults are not often going to lead to a frank disease. Many of the outcomes we're looking at are more subtle, such as cognitive impairments. We are making inroads into how environmental insults potentially contribute to clinical disorders — autism is one example, but there's work in the ADHD field as well, and now schizophrenia."

It seems that the field has moved beyond whether environmental insults have an impact upon those disorders to more focused research on specific interactions and mechanisms. Is that an accurate assessment?

"I think that's a very insightful comment. When I came to NIEHS ten years ago, people were beginning to be concerned about the big rise in autism. Every paper on autism was about genetics, genetics, genetics. And now, although progress is never fast enough, I'm in a position to see what I consider to be very good scientific progress. Even among the autism genetics investigators, there is acknowledgment that environment is involved, and it's no longer just that we'll eventually find genetic causes for every single case. In one sense it's a small step, but there is this acknowledgment that the real answer is going to have to involve looking at both environmental and genetic risk. That doesn't mean that it's easy to do — it's very, very difficult."

“The real continued progress in autism or ADHD or schizophrenia is, for our Institute, going to depend on the types of developmental tools and approaches that we’re hearing about at this meeting. They are not going to come from researchers trying to look for associations between exposures and disease, they’re going to come from, for instance, the exposure science arena, where people are developing better ways to capture exposures in the same way that you can capture the whole genome.”

Do you think any of the ideas we’ve heard about at this meeting approach being ready for translation into prevention, therapy, or even public health policy?

“I think most of what we’ve heard here is meant to be provocative. There’s a solid foundation of proof of principle. For example, there’s every reason to believe that the immune system is dysregulated in autism.

And there’s increasing evidence that disrupted thyroid signaling is involved somehow. But thyroid signaling is incredibly complex, and the clinical phenotypes that are present are complex as well.

In the case of how that might apply to something like autism risk, it’s really difficult to see how at this point in time you could apply that knowledge directly. That doesn’t mean that that’s not where we hope to go with it, but I think now it would be a little premature to think about a lot of direct translation to the clinic.

In the case of endocrine disruptors, our Institute has a really strong interest in that, but they are a class of chemicals that has not been a major focus of work in the autism arena. There’s been a little bit of work with compounds that act through the thyroid, affecting hormone signaling, but overall they’ve been a little bit neglected, so this meeting is meant to stimulate interest.”

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

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NIEHS figures prominently at annual GEMS meeting

By Ernie Hood

Oxidative stress and the role of metals and metalloids in cancer was the central theme at the fall meeting of the [Genetics and Environmental Mutagenesis Society \(GEMS\)](#), where NIEHS and NTP staff played a prominent role. Beginning with a keynote presentation by NTP toxicologist Michelle Hooth, Ph.D., the 29th annual meeting was rounded out by a presentation from Jeffrey Stumpf, Ph.D., a postdoctoral fellow in the NIEHS Mitochondrial DNA Replication Group, and a winning poster presentation by Shay Covo, Ph.D., a visiting fellow in the Chromosome Stability Group.



Lawler, front, second from right, represented NIEHS on the panel discussing endocrine disruption and sex differences in autism at the 27th International Neurotoxicology Conference. (Photo courtesy of Steve McCaw)

About 100 GEMS members from the Triangle area, including many from NIEHS, attended the group's semiannual, daylong gathering Nov. 8 at the University of North Carolina William and Ida Friday Center for Continuing Education in Chapel Hill, N.C. Historically, each meeting has its own scientific theme, and according to outgoing GEMS President Steve Little and incoming President Nagu Keshava, Ph.D., both of whom work at the U.S. Environmental Protection Agency (EPA) and organized the meeting, this conference's core concept was a natural. "We felt that oxidative stress is very timely at this point, because a lot of work is going on in some of these metals and metalloids," said Keshava.

"Traditionally, we have focused on genotoxicity within GEMS, and how it leads to DNA damage and cancer," added Little. "Those have been big topics and this meeting's theme really fit in well with that traditional area of science that we've tended to follow."

The meeting highlighted three full scientific presentations. David Thomas, Ph.D., from the EPA National Health and Environmental Effects Research Laboratory, spoke on arsenic metabolism; Adriana Oller, Ph.D., from the Nickel Producers Environmental Research Association, discussed nickel carcinogenicity; and Hooth presented a comprehensive look at the NTP's two-year rodent bioassays of hexavalent chromium, the most toxic form of the metalloid and a drinking water contaminant of public health concern. She said that the studies showed increased incidences of tumors in male and female rats and mice that were given hexavalent chromium in their drinking water. She also noted that a number of state and federal regulatory agencies have used the NTP hexavalent chromium data to aid risk assessments for human health implications.

Stumpf was among the participants in the platform presentation competition among junior researchers, describing his group's work on the role of POLG mutations in sensitivity to DNA-damaging environmental agents leading to acquired mitochondrial toxicities.

There was also a poster competition among students and postdocs, with a \$250 cash prize in both categories. Covo took the honors in the postdoc competition, with a poster on prevention of aneuploidy by sister chromatid cohesion.

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



Covo, right, had the winning poster among the postdocs at the 29th annual GEMS fall meeting. (Photo courtesy of Steve McCaw)



In one of the meeting's keynote addresses, Hooth described findings on oral exposures to hexavalent chromium, a drinking water contaminant. (Photo courtesy of Steve McCaw)



As it usually does at its fall meeting, GEMS conducted a considerable amount of business at the conference. A slate of new officers was elected, including Keshava, right, taking over the reins as president-elect from Steve Little. (Photo courtesy of Steve McCaw)



Stumpf, right, was among the junior investigators who presented their work at the GEMS meeting. (Photo courtesy of Steve McCaw)

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A genomics approach toward understanding autism

By Brant Hamel

Valerie Hu, Ph.D., visited NIEHS Nov. 2 as part of the continuing Keystone Science Lecture Seminar Series sponsored by the Division of Extramural Research and Training. Hu's presentation, titled "An Integrative Genomics Approach toward Understanding, Diagnosis, and Personalized Treatment of Autism Spectrum Disorders," explored how genomics data may help to understand the causes, and improve the diagnosis and treatment, of autism spectrum disorders.

Hu is a professor of biochemistry and molecular biology at the George Washington University School of Medicine and Health Sciences. Although she has researched many scientific areas over the years, she became interested in autism seven years ago for a very personal reason — she has a son who is affected by the disorder. Her research has led her to explore how dividing autism cases into subgroups can promote the identification of genes associated with the disorder. Additionally, she is investigating the role of epigenetic mechanisms and environmental factors that may influence the disease pathology.



In a moment of jocularity, Hu noted the mildest case of autism spectrum disorder often results in personalities similar to many scientists she has encountered. (Photo courtesy of Steve McCaw)

A biological diagnosis for autism

Hu explained that autism cannot be thought of as a single disease, but rather a collection of disorders that spans a broad continuum, with major symptoms including deficiencies in social interaction, language or communication abnormalities, restricted or repetitive behaviors, and savant-like skills in about 10 percent of cases. Due to the variety of symptoms and severities of autism spectrum disorder, it is believed to have multiple etiologies.

Currently, autism spectrum disorder is only diagnosed through behavioral observations, such as the Autism Diagnostic Interview Revised (ADIR) assessment. Classical genetic studies have not been successful in associating genes with increased risk for autism, perhaps due to its heterogeneous nature. Hu's insight led her to use ADIR scores to classify autism spectrum disorders into subgroups, prior to analyzing genome-wide association data. Interestingly, she found single nucleotide polymorphisms, or SNPs, unique to each subgroup that could allow autism to be diagnosed with over 98 percent accuracy. This discovery could eventually lead to a biological determination of autism, to supplement current behavioral observations that have multiple drawbacks.

Personalized treatment options

Armed with the knowledge that autism has a variety of causes and symptoms, Hu used gene expression profiling of lymphoblastoid cell lines to look at genes unique to certain subclasses of autism spectrum disorder. In the case of individuals who displayed the most severe language disruptions, she found a number of genes linked to circadian rhythm that suggested potential treatment options. For example, the AA NAT gene, which encodes an enzyme necessary for the production of melatonin, was found to be uniquely linked to this subtype, suggesting that melatonin treatment may be useful in alleviating some of the common sleep deprivation symptoms commonly reported in this population.

Similarly, linkage of DYPD, a gene commonly deleted in patients who suffer seizures, suggests that anticonvulsant medications may benefit this subgroup of autistic individuals. Hu hopes that, in the future, by understanding the mechanisms behind an individual case of autism, doctors will be able to deliver personalized treatment plans based on the patient's specific gene expression profile.

Exploring epigenetic and environmental factors

Hu has expanded beyond simply looking at gene expression, to include studies that examine the role epigenetic modification might play in influencing autism. By combining her gene expression studies with global epigenetic analysis, Hu discovered that RORA, an orphan nuclear receptor related to the retinoic acid receptor, is specifically methylated in autistic individuals, leading to its decreased protein expression in the brain. Furthermore, she went on to show that estrogen upregulates the expression of RORA, while testosterone downregulates its expression. Coupled with the fact that RORA regulates an enzyme that converts testosterone to estrogen, this may partially explain the observation that autism spectrum disorder is more common in males than females. Additionally, as RORA is the first hormonally responsive gene linked to autism, it may be a link between autism and endocrine disrupting chemicals in the environment, an area she would like to explore in the future.

(Brant Hamel, Ph.D., is a postdoctoral fellow in the NIEHS Molecular Endocrinology Group.)

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Duke symposium tackles later life consequences of early life exposures

By Ian Thomas

The NIEHS Superfund Research Program at Duke University welcomed toxicologists from around the country, as well as the general public, to the Washington Duke Inn in Durham, N.C., Nov. 4 for a science symposium titled “Early Life Exposures and Later Life Consequences: Mechanisms Underlying Vulnerability.” Highlighted by an array of presentations from several of the Institute’s grantees, the daylong event showcased the latest in environmental health research pertaining to the later life effects of early development exposures.

“There are a number of diseases that occur throughout a person’s lifespan, which were initiated long before the actual diagnosis,” said NIEHS/NTP Director Linda Birnbaum, Ph.D., the symposium’s keynote speaker. “We’re seeing this every day, particularly with children. From asthma to learning differences, or even sensitivity to infections, kids today face an increased risk for all of these and more, and much of that can be traced to exposures dating as far back as the prenatal period.”

The environmental connection

As was a common theme throughout the day, new research is drawing an ever-clearer link between environmental exposures and human disease. Perhaps nowhere is this phenomenon more visible than in the dramatic rise of obesity.

“Two-thirds of the adults in our country are overweight, with a body mass index greater than 25, and half of those qualify as obese,” explained Birnbaum. “Some of this can be attributed to the economy, and the fact that less nutritious food is usually the most affordable. However, the research clearly shows that environmental factors, such as paternal exposure to cigarette smoke or car exhaust, are directly connected to this outcome.”

Still, the drastic rise in national obesity is far from the only challenge facing mainstream America today, a point echoed by [Irva Hertz-Picciotto, Ph.D.](#), an autism specialist from the University of California (UC), Davis. “In the last thirty years, the number of autism cases has jumped radically from 1 in 700 kids to roughly 1 in 110,” she said, noting the extreme relevance of these statistics to males. “At present, for every one autistic girl, we’re seeing four autistic boys.”



Birnbaum set the tone for the meeting in her keynote speech addressing early life exposures. (Photo by Steve McCaw)



Heather Stapleton, Ph.D., an assistant professor of environmental chemistry at Duke and another NIEHS ONES awardee, discussed her [research](#) on chemical flame retardants. (Photo by Steve McCaw)

The epigenetic edge

While much of the symposium was devoted to connecting the dots between early environmental exposures and later life disease, another major theme of the meeting involved the need for a broader, research-based understanding of this relationship at the cellular level.

“Epigenetics explains why a skin cell is a skin cell, or a lung cell is a lung cell,” Birnbaum observed. “However, it can also be used to demonstrate how the environment influences our development, because it showcases how these factors alter the expression of our genes.”

NIEHS grantee [Joel Meyer, Ph.D.](#), agreed. “Certain types of in utero exposures have alerted us to the importance of mitochondrial DNA as a target of developmental exposure with later life consequences,” said Meyer, an assistant professor of environmental toxicology at Duke and recent NIEHS Outstanding New Environmental Scientist (ONES) awardee. “My concern is that environmental pollutants that affect mitochondria may have similar effects.”

Looking through the window

Research has long since shown that different parts of the body have different windows of susceptibility toward illness. However, in recent years it has become increasingly clear that many of these windows are partially, if not solely, dictated by the developmental stage of the tissues under exposure.

“The time of exposure can have very different effects on very different tissues,” Birnbaum concluded. “That’s why it’s vital for those of us who were trained as toxicologists get beyond the one chemical, one effect paradigm and look at the whole picture, because it’s all a function of when these exposures are occurring and where.”

The symposium was supported by the newly refunded [NIEHS Superfund Research Center](#) at Duke, in conjunction with the school’s [Integrated Toxicology and Environmental Health Program](#).

(Ian Thomas is a public affairs specialist with the NIEHS Office of Communications and Public Liaison.)



Meyer focused on the effects of environmental pollutants on mitochondrial DNA as an area of concern. (Photo by Steve McCaw)



A rainy day at the Washington Duke Inn didn't dampen the enthusiasm of the symposium's speakers or the researchers gathered to hear the latest in exposure science. (Photo by Steve McCaw)

Symposium Speakers

- Linda Birnbaum, Ph.D., NIEHS/NTP
– *Later life consequences of early life exposures*
- Heather Stapleton, Ph.D., Duke University
– *Exposure to PBDE flame retardants during early development and associated health risks*
- Joel Meyer, Ph.D., Duke University
– *Mitochondrial DNA as a target of developmental exposures*
- Mark Hahn, Ph.D., Woods Hole Oceanographic Institute
– *The roles of conditional transcription factors in mechanisms of developmental toxicity: Insights from fish models*
- Irva Hertz-Picciotto, Ph.D., UC Davis
– *Autism and the environment: Early life risk factors as etiologic clues*
- Virginia Rauh, Sc.D., Columbia University
– *Seven year neurodevelopment and prenatal exposure to chlorpyrifos, a common agricultural pesticide*
- Theodore Slotkin, Ph.D., Duke University
– *How early life exposures to common pesticides can lead to metabolic dysfunction, diabetes, and obesity*
- Robert Tanguay, Ph.D., Oregon State University
– *Defining the role of microRNAs as mediators of developmental toxicity in zebrafish*
- Edward Levin, Ph.D., Duke University
– *Developmental pesticide impacts on cognitive and emotional function in zebrafish and rats*

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Brain development dependent on thyroid hormone

By Robin Arnette

In vertebrates, thyroid hormone regulates metabolism, influences protein production, and helps regulate the growth of long bones. Now, scientists at NIEHS have discovered a new mechanism for how this important hormone also regulates brain development.

Work from the Membrane Signaling Group, led by [David Armstrong, Ph.D.](#), provides the first molecular evidence that during mouse brain growth, thyroid hormone changes the strength of nerve cell connections, or synapses, in the hippocampus, by activating phosphatidylinositol 3-kinase (PI3K). PI3K is an enzyme that is essential for cell development and survival, and altering synaptic strength in the brain's hippocampus is believed to be crucial for learning and memory. Their findings were presented Nov. 12-16 at the 2011 [Society for Neuroscience](#) meeting in Washington, D.C.

“For a century, people knew that thyroid hormone was essential for normal brain function, but they didn’t know why,” Armstrong said. “Scientists assumed that thyroid hormone was regulating gene expression, because the receptor for thyroid hormone binds to DNA in the nucleus.”

It turns out that thyroid hormone also has effects in the cytoplasm of a cell, joining many other hormones that stimulate PI3K.

Making the connection

Armstrong and his colleagues, Nina Storey, Ph.D., and John O'Bryan, Ph.D., who were at NIEHS at the time, first theorized there was a connection between thyroid hormone and PI3K. Their 2002 [paper](#), which was published in the journal *Current Biology*, showed that the rapid effects of thyroid hormone on potassium channel activity in rat pituitary cells were blocked by drugs that inhibit PI3K.

In these latest experiments, Armstrong's team generated a mouse strain, by removing a single tyrosine in one of the receptors for thyroid hormone called thyroid receptor beta (TRbeta). Doing so prevented thyroid hormone from stimulating PI3K, without affecting the ability of TRbeta to bind DNA. According to Fengxia Mizuno, Ph.D., the research fellow in Armstrong's group who did the electrophysiology work, it did something else that no one expected.

"When I recorded the strength of synapses in hippocampal neurons from mice with the mutated TRbeta, they were much weaker than synapses in normal mice," Mizuno explained. "Even the addition of thyroid hormone or neuronal activity couldn't strengthen them."

Mizuno added that weaker synapses in the hippocampus may play a role in learning disabilities, and she hopes that the research will help scientists understand how learning and memory work, how the brain develops, and how environmental chemicals that disrupt this pathway make the brain vulnerable.

Results bring more questions

Armstrong said his conclusions made him wonder whether the physiological changes his team observed in individual neurons have an effect on the animal's behavior. It's the next logical step in his experiments, and the studies are currently underway in collaboration with [Sheryl Moy, Ph.D.](#), associate professor in the Department of Psychiatry at the University of North Carolina at Chapel Hill School of Medicine.

In addition, Armstrong's group is attempting to put the human TRbeta into the mutant mice strain to see if it will rescue the effect. Because the hippocampus is an ancient part of the brain, Armstrong insists there isn't a big difference at the cellular level between humans and mice.

Being the first group to show that thyroid hormone has a rapid effect on PI3K production was a thrill, but uncovering the molecular mechanism and showing how a single amino acid change in one protein could have such a profound effect on synaptic function is just as gripping.

"We're excited that our basic research is turning out to have physiological significance," Armstrong said. "Now, we hope to use our understanding of the mechanism to identify chemicals in the environment that disrupt thyroid hormone signaling."

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Armstrong said that the amino acid tyrosine that he mutated in TRbeta only occurs in mammals and doesn't appear in reptiles or fish. "In essence, what we've done in the mice is to make them frog-like or fish-like," he said. (Photo courtesy of Steve McCaw)



Mizuno presented the group's data at the 2011 Society for Neuroscience meeting. (Photo courtesy of Steve McCaw)

Overcoming phosphate congestion in high energy signaling molecules

By Emily Zhou

In a new study published in *Nature Chemical Biology*, NIEHS researchers describe, for the first time, the crystal structure of a key inositol pyrophosphate kinase, PPIP5K2. Huanchen Wang, Ph.D., an Intramural Research Training Award fellow in the NIEHS Laboratory of Signal Transduction (LST) and 2012 Fellows Award for Research Excellence winner, was first author on the paper by a team of researchers from the LST Inositol Signaling Group, NIEHS Laboratory of Structural Biology, and University of Texas Southwestern Medical Center.

The enzyme's product, bis-diphosphoinositol tetrakisphosphate (IP8), is emerging as a regulator of the compartmentalization of cell signaling enzymes, which in turn determines the specificity of signaling responses, such as insulin signaling and neutrophil function, in innate immunity.

In the study, atomic structures of the kinase domain of human PPIP5K2 were analyzed. "These analyses provide molecular insight into the evolution of a specialized catalytic environment," commented lead researcher [Stephen Shears, Ph.D.](#), senior author on the study. "This work shows how a signaling molecule with unrivaled phosphate congestion can be synthesized." Wang added, "This structural information will also be useful for developing small molecule inhibitors of the kinase for possible therapeutic benefit."

Inositol pyrophosphates

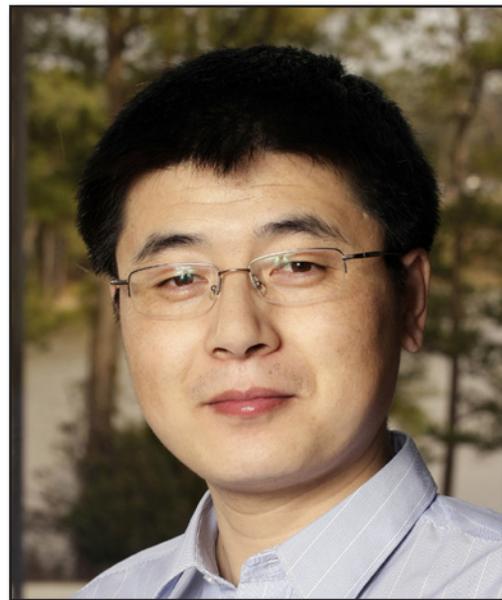
The inositol phosphates signaling field has expanded to include two molecules, IP7 and IP8 that contain diphosphate groups, also known as pyrophosphates. The presence of these diphosphate groups in inositol pyrophosphates is a functionally significant feature, because it facilitates the ability of these molecules to compete with membrane lipids for binding to other proteins, explained Shears.

"This phenomenon appears to explain how IP7 and IP8 can antagonize signaling by insulin, and also regulate neutrophil function," continued Shears. "That is, work with the inositol pyrophosphates has helped us understand micro-compartmentalization of cell signaling, one of the major current goals in this field."

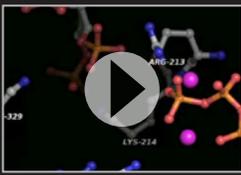
Reaction mechanism of human PPIP5K2

Phosphate groups are large and electrostatically charged, so their natural tendency is to repel each other. The catalytic challenge for PPIP5K2 is to add one more phosphate to a molecule, IP7, that already has seven phosphates crowded around a small six-carbon inositol ring.

Wang's structural approach to understanding how phosphate crowding is surmounted reveals a catalytic site in which an array of positively charged amino acid residues in the enzyme interact with phosphate/pyrophosphate groups of IP7 and the donor phosphate from ATP. This interaction neutralizes their negative charges, thereby minimizing electrostatic repulsion. Furthermore, the presence of crystals of PPIP5K2 in complex with a transition-state mimetic suggests an inline associative reaction mechanism, further explaining how the enzyme overcomes the energy barrier to efficient catalysis.



Trained as a biochemist and structural biologist at the University of North Carolina at Chapel Hill, Wang has made significant contributions to defining phosphodiesterase structures and exploration of phosphodiesterase inhibitors for potential therapeutic benefits. Wang acknowledged the guidance of [Traci Hall, Ph.D.](#), head of the NIEHS Macromolecular Structure Group, on this important project. (Photo courtesy of Steve McCaw)



Linked video:
[Watch the mechanism behind phosphate crowding \(00:35\)](#)
(Launches in new window)

Download Media Player: [Quicktime](#)

Future prospects

Wang explains that the team's stereoselective resolution of the structure will now permit the chemical synthesis of physiologic isomers, the deciphering of their molecular interactions with receptors, and the design of antagonists. "Overall, the structural information obtained from this study offers directions for studying the evolution of active sites of diverse phosphoryl transferases," Wang said, "and also offers templates for an underdeveloped area of research — the rational design of inhibitors that specifically target a particular inositol phosphate kinase."

Citation: Wang H, Falck JR, Hall TMT, Shears SB. 2011. Structural basis for an inositol pyrophosphate kinase surmounting phosphate crowding. *Nat Chem Biol*; doi:10.1038/nchembio.733 [Online 27 November 2011].

(Emily Zhou, Ph.D., is a research fellow in the NIEHS Laboratory of Signal Transduction Inositol Signaling Group.)

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Winuthayanon presents at NIH Research Festival

By Eddy Ball

As it has for the past 25 years, the National Institutes of Health (NIH) devoted a week this year to celebrating its Intramural Research Program with the annual [NIH Research Festival](#) Oct. 24-28 in Bethesda, Md. This year's fair featured an invited talk by one of the 21 NIEHS fellows honored with the 2012 Fellows Award for Research Excellence (FARE), Wipawee (Joy) Winuthayanon, Ph.D. ([see story](#)).

[Winuthayanon](#) is a research fellow in the Laboratory of Reproductive and Developmental Toxicology (LRDT) Receptor Biology Group headed by lead researcher and LRDT Chief [Ken Korach, Ph.D.](#) She said afterwards that she was very excited to have had the opportunity to speak at the Research Festival.

Reproductive tract development and function

In an effort to better understand the impact of estrogenic environmental chemicals and their impact on very early mammalian pregnancy, Winuthayanon and colleagues explored the role of epithelial estrogen receptor alpha (ERalpha) in the oviduct during fertilization and embryo development. The team examined ovulation and preimplantation embryo development and embryo outcomes in experimental conditional knockout mice lacking ERalpha in female reproductive tract epithelium, comparing them to findings in controls.



Shears is excited about further examining the role of IP8 and PPIP5K2 in regulating compartmentalization of cell signaling, as well as their physiological significance. (Photo courtesy of Steve McCaw)

The team cultured one-cell embryos from experimental and control mice *in vitro*. Very few of the embryos from experimental mice progressed to the expanding blastocyst stage, while most of the control embryos did, indicating that the lack of ERalpha in the experimental mice oviductal epithelium triggered changes that completely disrupted preimplantation embryo development. “This is a novel and unexpected regulatory phenomenon,” Winuthayanon concluded, “that will provide information important for understanding ... the roles of ERalpha in human fertility.”

NIEHS scientists at the Research Fair

Along with the talk by Winuthayanon, NIEHS participation included talks by lead researchers Carmen Williams, M.D., Ph.D., and Humphrey Yao, Ph.D., as well as plenary symposia facilitation by Yao, Korach, and Mitch Eddy, Ph.D. Among the eight NIEHS entries in the poster competition were ones by FARE winners Kristin Lichti-Kaiser, Ph.D., and Percy Tumbale, Ph.D.

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Winuthayanon's findings could help in the quest to understand how estrogen receptor in the epithelial cells of female reproductive tract may impact fertility and embryo development. (Photo courtesy of Steve McCaw)

Effects of lead exposure on obesity and bone loss

By Ian Thomas

The NIEHS Keystone Scientific Lecture series continued on Nov. 15 with a talk from Edward Puzas, Ph.D., an investigator in the field of musculoskeletal science from the University of Rochester and a long-time Institute grantee. Titled “Bone, Brain, and Fat: Is There a Unifying Principle Responsible for Multi-organ Toxicity?” Puzas’ presentation discussed his latest research into the effects of lead exposure on obesity and decreased bone formation.

“The human skeleton is a repository for many, many toxins, not the least of which is lead,” said Puzas, who is currently the University of Rochester’s senior associate dean for basic research and the Donald and Mary Clark professor of orthopedics. “More than 95 percent of the lead exposed to the human body is stored in the bones, which can result in the development of any number of debilitating diseases.”



Puzas' talk drew a sizable audience interested to hear about the relationship between lead and bone density. (Photo courtesy of Michael Garske)

From bone to fat

A major theme throughout Puzas' talk was the impact of lead exposure on stem cell development, specifically mesenchymal stem cells. According to Puzas, when these cells are exposed to lead, their natural tendency to become bone cells is drastically altered, resulting instead in an increased production of adipocytes, or fat cells.

“Obesity is associated with decreased bone quality and mass,” Puzas explained. “What we're seeing in mice is that, in many ways, exposure to lead can have a lot of the same effects as a high fat diet. Excessive weight gain, bone loss, an increased risk for fractures — we observed all of this in our experiment.”



NIEHS/NTP Director Linda Binbaum, Ph.D., enjoyed one of the lighter moments in Puzas' lecture. (Photo courtesy of Michael Garske)

The sclerostin factor

While the effects of acute and chronic lead exposure can have a wide array of outcomes, such as arthritis and osteoporosis, one of the ways in which this happens is through the manipulation of a powerful protein called sclerostin.

“Sclerostin is an extremely potent inhibitor of bone formation, which, when suppressed, leads to excessive bone growth,” said Puzas. “What we saw in our research was the opposite of that effect. Exposing subjects to lead actually increased the production of sclerostin, thereby leading to a noticeable retardation of bone growth.”

The devastating problem of osteoporosis

Chief among the diseases covered in Puzas' talk was osteoporosis, a devastating disease that causes decreased bone formation and an increased risk for skeletal breaks. Commonly found among seniors, it is extremely prevalent among women.

“In the United States alone, one out of three women will sustain a hip fracture by the age of 85,” said Puzas. “Every year, 15 percent of those women will die from complications stemming from those injuries. That mortality rate rivals both uterine and ovarian cancer, which is why it's crucial for everyone to take the proper measures to keep bones strong and resilient.”

A long way yet to go

As the cost of health care continues to climb, along with osteoporotic cases and childhood obesity, the need to know more about the various physiological and environmental factors that influence these conditions is clear. According to Puzas, lead exposure is most definitely a part of that discussion.

“Here in America, we've made some great strides in environmental legislation to mitigate some of these effects,” he concluded. “However, in places like Europe and Mexico, where much of the infrastructure is still fully leaded, people are still encountering heavy exposures every day. From our data we have estimated that approximately 1 in 7 of all osteoporotic cases were due to lead exposure. Apply that statistic to the number of cases around the world, and it's pretty easy to see why this is such a vital area of research.”

(Ian Thomas is a public affairs specialist for the NIEHS Office of Communications and Public Liaison.)

Exposome pioneer to be featured at workshop

By Eddy Ball

Registration is underway for a workshop on “[Emerging Technologies for Measuring Individual Exposomes](#)” Dec. 8-9 in Washington, D.C. The workshop will feature pioneers in the application of the concept of the exposome to environmental health studies, including NIEHS grantee [Stephen Rappaport, Ph.D.](#) In 2010, Rappaport and University of California, Berkeley colleague [Martyn Smith, Ph.D.](#), published a perspective in *Science* that challenged environmental health scientists to fully integrate individual exposure with the environmental equivalent of genome-wide association studies (see text box).

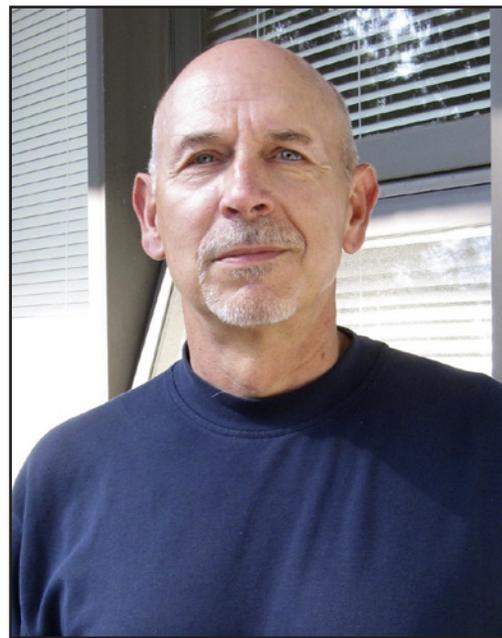


The Exposome and Adductomics: Promises and Pitfalls
Stephen Rappaport
School of Public Health
University of California, Berkeley
CEB
Work supported by NIEHS

Linked video:
[Watch as Rappaport describe how the concept of the exposome challenges the prevailing paradigm of environmental health \(26:39\)](#)

(Launches in new window)

Download Media Player:  Flash [↗](#)



Rappaport is director of the Berkeley Center for Exposure Biology, a multidisciplinary program with the goal of developing a new generation of biomarkers and biosensors for environmental epidemiology. (Photo courtesy of Stephen Rappaport)

The event is free and open to the public, but [registration](#) is required for those planning to attend in person or access the webcast.

The workshop is the latest in the National Academy of Sciences (NAS) ongoing series, organized by the Standing Committee on Use of Emerging Science for Environmental Health Decisions sponsored by NIEHS. The event is the outgrowth of a [2010 workshop](#) on the exposome.

This workshop will take a close look at emerging technologies that can be used to gather individual exposure information, based upon external and internal measurements. Presentations and discussions will explore which of the technologies are ready now and which are still emerging for use in environmental health research.

Particular attention will be paid to the relative advantages and disadvantages of external and internal measurements for characterizing individual exposomes, and for performing environment-wide association studies. Recent proof-of-concept studies will be highlighted and bioinformatic tools will be discussed. This synthesis should inform researchers and policy makers about the critical roles that the exposome concept and new technologies can play in understanding the origins of human diseases.

Rappaport will welcome workshop participants and outline workshop objectives. He will also present a talk on “Using -Omics Methods to Characterize Individual Exposomes” during Session One and chair the workshop’s concluding roundtable discussion the next day on “Individual Exposomes and Environmental Health Decisions,” before presenting closing remarks.

NIEHS Program Administrator David Balshaw, Ph.D., will co-chair a session on “Building the Individual Exposome,” which will explore new developments of personal sensors and laboratory analysis of the exposome. Other current and former NIEHS grantees at the workshop include Michael Jerrett, Ph.D., speaking on “Using Personal Monitors and Sensors to Characterize Individual Exposures”; Nongjian Tao, Ph.D., discussing “Sensors to Monitor Individual Exposures to Multiple Air Pollutants”; Avi Spira, M.D., exploring “Gene-expression Profiles as Signatures of Environmental Exposures”; and Stephen Intille, Ph.D., outlining “Personal Measurements of Physical Activity.”

Advocating more detailed assessment of the individual exposome

In their Science article, Rappaport and Smith stressed that the exposome includes all toxic chemicals, from all sources, present in a person's internal chemical environment where disease processes originate. Evaluating the exposome is important, because internal chemical environment reflects the combined effects of contaminants from air, water, and food, as well as toxic chemicals produced in the body as a result of inflammation, oxidative stress, lipid peroxidation, infections, gut flora, and other natural processes.

Rappaport and Smith advocated a balancing of top-down investigation, the disease-first focus on biological response and measurement of endogenous and exogenous molecules in biological fluids, and a bottom-up approach, working up from exposure assessment to biological response.

Rappaport and Smith are researchers in the [University of California, Berkeley Superfund Research Program](#).

Citation: Rappaport SM, Smith MT. 2010. Environment and Disease Risks. Science 330(6003):460-461.

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Susan Amara to present distinguished lecture

By Eddy Ball

The NIEHS 2011-2012 Distinguished Lecture Series returns to the fascinating world of neuroscience, with its next talk Dec. 13 by neurobiologist Susan Amara, Ph.D., on “The Ins and Outs of Neurotransmitter Transporters.”

[Amara](#) is the Thomas Detre Professor of Neuroscience and chair of the Department of Neurobiology at the University of Pittsburgh, as well as co-director of the Center for Neuroscience there. She is also past president of the Society for Neuroscience.

A Howard Hughes Medical Institute alumni scientist, Amara has received many honors for her work, including the John J. Abel Award from The American Society of Pharmacology and Experimental Therapeutics and a McKnight Award in Neuroscience. She received a 1997 MERIT Award from the National Institute on Drug Abuse, and she was elected to the National Academy of Sciences in 2004.

Amara lists her major research interests as the structure, regulation, and cellular physiology of two families of sodium-dependent neurotransmitter transporters — the biogenic amine and the excitatory amino acid carriers. The dopamine, norepinephrine, and serotonin transporters are well-established targets for addictive drugs, including cocaine and amphetamines, as well as for therapeutic antidepressants.

Her lab uses molecular genetic, electrophysiological, and cell biological approaches to explore the relationships between neurotransmitter transporter structure, substrate transport, inhibitor binding, and ion permeation.



Upcoming Distinguished Lecturer Susan Amara (Photo courtesy of Susan Amara)

NIEHS Ion Channel Physiology Group lead researcher [Jerrel Yakel, Ph.D.](#), will host the talk, which begins at 11:00 a.m. in the NIEHS Rodbell Auditorium.

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Testicular toxicology workshop spotlights animal testing alternatives

By Ian Thomas

Scientists and administrators from across the toxicology field took part in a two-day [workshop](#) Oct. 26-27 to discuss finding new alternatives to animal testing for assessing testicular toxicity. Held at the Mt. Washington Conference Center in Baltimore, Md., the event was sponsored by the ILSI Health and Environmental Sciences Institute Developmental and Reproductive Toxicology technical committee, in conjunction with the Johns Hopkins University Center for Alternatives to Animal Testing.

Paul Foster, Ph.D., a senior scientist with the National Toxicology Program (NTP), was the workshop's featured speaker. "My role was really to focus on how *in vitro* methods have been used successfully in the past, based on my 25 plus years in the field, and to identify some of the challenges we face moving forward," Foster noted.

Attended by members of the U.S. Food and Drug Administration, the U.S. Environmental Protection Agency, and an array of pharmaceutical and industry representatives, the workshop tackled a number of different issues, ranging from tissue engineering approaches to maintain physiology and structure in artificial organs to screening and prioritizing chemicals/drugs for testing in commercial applications.



Foster was the featured speaker at the Testicular Toxicology In Vitro Models workshop. (Photo courtesy of Steve McCaw)

A complex organ

While most toxicologists agree that there is a huge need for *in vitro* alternatives to animal testing, particularly with regard to pharmaceutical discovery and environmental component screening, a viable method for yielding the same level of integration of physiology and endocrinology has proven elusive.

"We've made significant advancements over the years with respect to *in vitro* testing for reproductive toxicity, but we're still a long way away from ever being able to use these methods as a replacement for animals in toxicity assessment, if ever," said Foster. "The mammalian testis is an extremely complex organ, and finding ways to successfully replicate the types of microenvironment and processes normally found in mammals has been an enormous challenge."

Foster was joined at the workshop by fellow toxicologist Elizabeth Maull, Ph.D., of the NIEHS Biomolecular Screening Branch, as well as grantees Elaine Faustman, Ph.D., of the University of Washington, and Mary Hixon, Ph.D., of Brown University.

(Ian Thomas is a public affairs specialist with the NIEHS Office of Communications and Public Liaison.)

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This month in EHP

By Ian Thomas

As the end approaches for a year marked by record storm flooding, the December issue of [Environmental Health Perspectives \(EHP\)](#) examines the adaptive strategies being implemented to upgrade aging city infrastructure in the face of growing climate change effects. With growing concerns over stormwater-caused pollution, the renovation of existing water and sewer systems has proven to be a challenge. However, many now view green methods as a possible way of streamlining the process.

In a second story, titled “Sharing Science: Enabling Global Access to the Scientific Literature,” EHP takes stock of the decade-long push to bring greater informational access to scientists and researchers in poverty-stricken and developing nations.

In this month’s Researcher’s Perspective [podcast](#), host Ashley Ahearn discusses the growing connection between climate change and child undernutrition with Sari Kovats, a senior lecturer in environmental epidemiology with the London School of Hygiene and Tropical Medicine.

Featured commentaries, reviews, and research this month include the following:

- Linking Epidemiology with Risk Assessment
- PBPK and Systems Biology Modeling of Interactions
- Signal-to-Noise Crossover Dose for Risk Assessment
- Bisphenol A and Gene Expression in Vivo
- Early Life Soy Exposure and Gendered Play Behavior
- Climate Change, Crop Yields, and Future Undernutrition

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

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Extramural papers of the month

By Nancy Lamontagne

- [Chimneys help reduce severe childhood pneumonia](#)
- [Aggressive breast cancer responds to blueberries](#)
- [Mycoestrogens influence development](#)
- [The impact of nutrition labeling](#)



<http://twitter.com/ehponline>



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

Chimneys help reduce severe childhood pneumonia

An NIEHS grantee, working with rural communities in Guatemala, found that rates of severe childhood pneumonia were reduced by 30 percent in households using cooking stoves with chimneys rather than open, indoor wood cooking fires. The findings suggest that interventions that lower exposure to wood smoke may help reduce childhood deaths from pneumonia in areas of the world where indoor open fires are commonly used.

The results come from the NIH Randomised Exposure Study of Pollution Indoors and Respiratory Effects (RESPIRE) trial, which included 534 rural Guatemala households with a pregnant woman or young infant. The households were randomly assigned to receive a locally developed chimney stove or to act as a control by using open wood fires. In addition to the reduction in severe pneumonia, the researchers found that carbon monoxide exposure levels in the homes equipped with chimneys were, on average, half that of the households with the open fires. The stoves with chimneys did not significantly reduce the total number of diagnosed childhood pneumonia cases, but the reduction in severe pneumonia could likely reduce childhood mortality.

Citation: [Smith KR](#), [McCracken JP](#), [Weber MW](#), [Hubbard A](#), [Jenny A](#), [Thompson LM](#), [Balmes J](#), [Diaz A](#), [Arana B](#), [Bruce N](#). 2011. Effect of reduction in household air pollution on childhood pneumonia in Guatemala (RESPIRE): a randomised controlled trial. *Lancet* 378(9804):1717-1726.

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Aggressive breast cancer responds to blueberries

NIEHS grantees report that blueberry consumption lessened the growth and spread of triple negative breast cancer cells in mice. Very few drugs are effective against this aggressive form of breast cancer, which does not express the estrogen receptor, progesterone receptor, or human epidermal growth factor receptor 2 (HER2) protein.

The researchers experimented with mice that were injected with triple negative breast cancer cells. Compared to control mice receiving no blueberry powder, those receiving a diet that included five percent freeze-dried whole blueberry powder had a tumor size 75 percent smaller. Tumor size was 60 percent smaller if the mice received ten percent blueberry powder. Molecular analysis showed that the blueberry consumption altered expression of genes tied to inflammation, cancer, and metastasis in ways that would lower cancer risk. In another experiment, the researchers found a significant decrease in metastasis in mice that consumed a diet including five percent blueberry powder, compared to those that did not consume blueberry.

Although more research is needed to confirm the effect in humans, the amount of blueberry powder used in the experiments could be reasonably consumed. The five percent blueberry powder is equivalent to about two cups of blueberries a day. The researchers are planning clinical trials using whole blueberry powder to determine a suitable human dose.

Citation: [Adams LS](#), [Kanaya N](#), [Phung S](#), [Liu Z](#), [Chen S](#). 2011. Whole blueberry powder modulates the growth and metastasis of MDA-MB-231 triple negative breast tumors in nude mice. *J Nutr* 141(10):1805-1812.

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Mycoestrogens influence development

Exposure to mycoestrogens appears to affect the body size and breast development of girls, according to a study from NIEHS-supported researchers. This could have implications for future breast cancer risk.

The researchers looked at zearalenone and zeranol mycoestrogens, which are commonly found in the food supply. Zearalenone is a fungal product that can be found in grains and plant foods consumed by livestock or humans, and zeranol is sometimes used to enhance meat production. They studied 163 healthy girls (ages 9 and 10) participating in the Jersey Girl Study, which is examining factors affecting the onset of puberty in girls.

The mycoestrogens were detected in the urine of 78 percent of the participants, and girls tended to be shorter and less likely to have reached the onset of breast development if urinary mycoestrogens were detected. Preliminary analysis associated intake of beef and popcorn with urinary mycoestrogens. The results point to the need for more research to fully understand the effects of mycoestrogens on development.

Citation: [Bandera EV, Chandran U, Buckley B, Lin Y, Isukapalli S, Marshall I, King M, Zarbl H.](#) 2011. Urinary mycoestrogens, body size and breast development in New Jersey girls. *Sci Total Environ* 409(24):5221-5227.

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The impact of nutrition labeling

Researchers supported by NIEHS report that nutrition labeling on fast-food restaurant menus increased parent awareness of calories, but did not decrease the calories actually purchased for parents or children. Chain restaurants will be required to post nutritional information at point-of-purchase as part of national health reform, but few studies have examined how these regulations will affect children.

The researchers recruited participants from the Neighborhood Impact on Kids study. They compared restaurant receipts for 75 children (ages 6 to 11) and their parents, before and after menu-labeling regulation in Seattle/King County, Wash., with receipts from 58 children and parents in San Diego County, Calif., where the regulation was not implemented.

In Seattle/King County, the percentage of parents seeing the nutritional information increased from 44 percent prior to regulation to 87 percent after menu labels were added, but the average calories purchased for children did not change after regulation in either county. Although there was an approximate 100-calorie decrease in food purchased for the parents post-regulation, there was no significant difference between the counties.

Citation: [Tandon PS, Zhou C, Chan NL, Lozano P, Couch SC, Glanz K, Krieger J, Saelens BE.](#) 2011. The impact of menu labeling on fast-food purchases for children and parents. *Am J Prev Med* 41(4):434-438.

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

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Intramural papers of the month

By Robin Arnette, Raluca Dumitru, and Brant Hamel

- [One apolipoprotein E allele associated with lower risk of Parkinson's](#)
- [Effects of endothelial CYP2C8 epoxygenase on cardiac recovery](#)
- [Aprataxin structure links DNA repair mechanism to neurodegenerative disease](#)
- [New algorithm identifies transcription factors and coregulators in ChIP-seq data](#)

One apolipoprotein E allele associated with lower risk of Parkinson's

A recent study published in the journal *Neurobiology of Aging* suggested that apolipoprotein E (ApoE) epsilon4, a known risk allele for Alzheimer's disease, was associated with a lower risk of Parkinson's in non-Hispanic Caucasians. The data also indicated that epsilon4 tended to correspond to a 60 percent higher risk of dementia among Parkinson's patients. The work was a collaborative effort between scientists from NIEHS, Pennsylvania State University, the National Cancer Institute, and AARP.

The research team became interested in examining the connections between ApoE alleles and Parkinson's, because of the inconsistencies in the epidemiological literature, the clinical and epidemiological similarities between Parkinson's and Alzheimer's, and recent evidence that higher plasma cholesterol was associated with a lower risk for Parkinson's disease. The team performed this population-based case-control study using 786 Parkinson's patients from the Parkinson's, Genes, and Environment study, a case-control study within the large prospective NIH-AARP Diet and Health Study cohort. The study had 1537 healthy adults to serve as controls.

The investigators collected saliva samples from volunteers and contacted the patients' treating physicians to confirm a Parkinson's diagnosis. They extracted DNA from the saliva and genotyped two single nucleotide polymorphisms (SNPs) to determine ApoE alleles: epsilon3, epsilon4 or epsilon2. The team then conducted statistical analysis. Compared with epsilon3 carriers, participants that carried the epsilon4 allele had significantly lower odds of having Parkinson's, while epsilon2 carriers did not.

Citation: [Gao J, Huang X, Park Y, Liu R, Hollenbeck A, Schatzkin A, Mailman RB, Chen H. 2011. Apolipoprotein E genotypes and the risk of Parkinson disease. *Neurobiol Aging* 32\(11\):2106.e1-6.](#)

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Effects of endothelial CYP2C8 epoxygenase on cardiac recovery

A new collaborative effort between investigators at NIEHS, Oregon Health and Science University, and the University of North Carolina at Chapel Hill defines, for the first time, the role that endothelial-derived versus cardiomyocyte-derived epoxyeicosatrienoic acids (EETs) play in cardioprotection following ischemia/reperfusion (IR) injury.

Conflicting reports link EETs with beneficial, as well as detrimental, effects on cardiac recovery after IR injury. Expression of CYP2J2 in cardiomyocytes was previously shown to improve the functional recovery and reduce

the infarct size after ischemia. Endothelial EETs are known to increase blood flow and reduce inflammation. However, other studies demonstrated that inhibition of CYP2C reduces infarct size after IR in isolated rat hearts.

To address the discrepancy, the investigators generated transgenic mice with increased endothelial EET biosynthesis (Tie2-CYP2C8 and Tie2-CYP2J2) or EET hydrolysis (Tie2-sEH) and compared them to mice with increased EET biosynthesis in cardiomyocytes (alphaMHC-CYP2J2) and wild-type (WT) mice. Compared to WT, the alphaMHC-CYP2J2 hearts had increased functional recovery and decreased infarct size after IR. In contrast, the Tie2-CYP2C8 hearts exhibited decreased functional recovery, due to increased production of reactive oxygen species and toxic linoleic acid metabolites.

These data confirm that CYP2J2 expression in cardiomyocytes is protective against IR injury, while endothelial-derived EETs have little effect. In contrast, the expression of CYP2C8 in endothelium has detrimental effects, which outweigh the potential benefits of increased EET biosynthesis.

Citation: [Edin ML, Wang Z, Bradbury JA, Graves JP, Lih FB, DeGraff LM, Foley JF, Torphy R, Ronnekleiv OK, Tomer KB, Lee CR, Zeldin DC. 2011. Endothelial expression of human cytochrome P450 epoxygenase CYP2C8 increases susceptibility to ischemia-reperfusion injury in isolated mouse heart. FASEB J 25\(10\):3436-3447.](#)

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Aprataxin structure links DNA repair mechanism to neurodegenerative disease

Using X-ray crystallography, NIEHS researchers have uncovered how the protein aprataxin recognizes and reverses damaged DNA. Aprataxin is a eukaryotic protein that is involved in the cellular response to genotoxic stress, and mutations in the human gene encoding the protein (APTX) cause a debilitating neurological disorder known as ataxia with oculomotor apraxia (AOA1). Until now, scientists weren't sure how these mutations affected aprataxin function.

Aprataxin normally acts to repair DNA as a DNA ligase proofreader in the cell by removing 5'-adenylated DNA left by aborted DNA ligation reactions. Using high-throughput robotics to screen a large number of crystallization conditions, the scientists crystallized a quaternary complex containing aprataxin, DNA, the DNA damage lesion 5'-adenosine monophosphate (AMP), and the metal cofactor zinc.

The structure revealed the two major domains in the protein: the HIT domain, which contains the wedge that allows access to the damaged DNA termini and the zinc finger domain, which combined with the HIT domain, specifically recognizes the structure of damaged DNA. The zinc finger domain surprisingly utilized a novel C2H2 Zn-binding motif to recognize damaged DNA in a sequence independent manner. This motif is a derivative of the classical C2H2 binding fold, and the finding implied that zinc finger-containing proteins may be much more widespread in nature than previously thought. With the aprataxin molecular structure in hand, scientists now have a template for understanding how APTX mutations inactivate this important DNA damage repair enzyme.

Citation: [Tumbale P, Appel CD, Kraehenbuehl R, Robertson PD, Williams JS, Krahn J, Ahel I, Williams RS. 2011. Structure of an aprataxin-DNA complex with insights into AOA1 neurodegenerative disease. Nat Struct Mol Biol 18\(11\):1189-1195.](#)

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New algorithm identifies transcription factors and coregulators in ChIP-seq data

Biostatisticians from NIEHS have developed a new method that determines which ChIP-seq data has binding sites for the transcription factor being immunoprecipitated and coregulatory factors. Called coMOTIF, the computational tool simultaneously models the coexistence of the two sequence motifs using joint distribution. It uses a technique to reduce the sampling space in the expectation-maximization (EM) algorithm, making a large-scale genomic search of transcription factors and their accompanying coregulators easier to find in ChIP-seq data.

Transcription factors and their accompanying coregulators work together to regulate gene transcription, but before the creation of coMOTIF, scientists had to search each ChIP-seq sequence one at a time to determine if they contained one or both motifs. As a result, the research team developed the new finite mixture model, which uses two known position weight matrices (PMWs) as starting points for the EM algorithm to simultaneously determine the two motifs.

coMOTIF has been proven to be more effective than the standard MEME+, because it allows nine states compared to MEME+'s three. It was tested on 10 simulated ChIP-seq datasets and did a better job of predicting which sequences contained both motifs. The coMOTIF software is freely available at <http://www.niehs.nih.gov/research/resources/software/comotif/>.

Citation: Xu M, Weinberg CR, Umbach DM, Li L. 2011. coMOTIF: a mixture framework for identifying transcription factor and coregulator motif in ChIP-seq data. *Bioinformatics* 27(19):2625-2632.

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Inside the Institute

NIEHS and CFC celebrate 50 years of giving

By Ian Thomas

With the annual bake sale and silent auction Nov. 18, NIEHS brought its promotion of the 2011 Combined Federal Campaign (CFC) to a close, with an impressive collection of \$82,152 in charitable contributions. CFC, which this year celebrated its 50th anniversary, is an annual fundraising drive, which collects cash and payroll deduction pledges from federal and military employees, for donation to local, national, and international nonprofit organizations.

While the events and marketing have officially ended, CFC organizers are quick to point out that pledges will continue to be accepted through Dec. 15, with an ultimate goal of reaching \$105,000.

“We really want to thank everyone who participated in this year’s campaign,” said Ron Cannon, Ph.D., staff scientist and NIEHS CFC co-chair. “Times are tight for a lot of people right now and yet everyone here at NIEHS really stepped up with some generous donations.”

Beyond the bake sale and silent auction, this year’s campaign presented employees with a number of ways to get involved. Other events included a charity fair, ice cream social, 5K walk/run, used book and DVD sale, Halloween costume contest, and raffle drawing for an Apple iPad 2.

“Donations don’t have to be enormous to have an enormous impact,” noted Cindy Innes, a biologist with the NIEHS Environmental Stress and Cancer Group and CFC co-chair with Cannon. “If a lot of people give a little bit, even if it’s just a few dollars per pay period, that goes a long way.”

To learn more about CFC, or to make a pledge online, visit <http://www.cfcgreaternc.org>.

(Ian Thomas is a public affairs specialist with the NIEHS Office of Communications and Public Liaison.)

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The CFC Halloween costume contest drew pledges and ghostly fun for NIEHS staff. (Photo courtesy of Ron Cannon)



NIEHS staff hit the trails for a morning of fitness and charitable giving. The 5K run drew nearly 100 participants. (Photo courtesy of Ron Cannon)



NIEHS
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