NIEHS exposome faculty connects scientists from across the institute

By Kelly Lenox

Scientists from across NIEHS gathered Jan. 10 to help inaugurate the Institute's exposome faculty. This was the second meeting of the newly formed group, which is working to develop the concept and study of exposome science at NIEHS.

The exposome, or the measure of a person's lifelong exposures to agents, both internal and external, is attracting increased attention from environmental health scientists worldwide.

Creation of the exposome faculty supports Goal 3 of the NIEHS 2012-2017 Strategic Plan, *(http://www.niehs.nih.gov/about/strategicplan/)* which calls for transforming exposure science by enabling consideration of the totality of human exposures and incorporating exposure science into human health studies. Priorities identified under the goal include defining and disseminating the concept of the exposome, and creating the tools and technologies, as well as research capacity, needed to characterize the exposome.

Longnecker offered examples of how current epidemiological studies might differ from exposome studies. "For instance, [one study] used dust samples, but not air samples," he said. (Photo courtesy of Steve McCaw)

Grappling with definitions

Definitions of the exposome have varied since Christopher Wild, Ph.D., a cancer epidemiologist, first coined the word in a 2005 journal article. *(http://www.ncbi.nlm.nih.gov/pubmed/16103423)* According to David Balshaw, Ph.D., acting chief of the NIEHS Exposure, Response, and Technology Branch and Exposure Biology Research Program lead, the scientific community is looking to NIEHS for leadership as a primary deliberative body for defining the emerging field of the exposome and exposomics.

Balshaw reminded participants not to overlook the rationale behind studying the exposome. Wild's initial definition of the exposome as the totality of life-course exposures from the prenatal period onwards is a grand vision and technically daunting.

"Definitions can be divisive. The essence of the exposome is that it will allow us to identify the associations between exposure and disease without preformed hypotheses," said Balshaw. "Rather than asking what is the association between particulate matter exposures and asthma, we can ask the broader question of what are the environmental factors that determine this biological endpoint. The science of the exposome is in how you perform that analysis."

Balshaw described the exposome as a means of discovering associations between environmental exposures and a biological point of interest. (Photo courtesy of Steve McCaw)

Obtaining, storing, and processing data gets expensive

Matthew Longnecker, M.D., Sc.D., head of the NIEHS Biomarker-based Epidemiology Group, discussed three cohort studies currently underway - the Sister Study, the GuLF STUDY, and the Norwegian Mother and Child Cohort Study - and described how data requirements for exposome studies might differ from the needs of the studies.

"In some cases, the data so far represent one point in time. Data and sample size are often limited by the expense of collecting and storing samples, as well as data processing," he said.

Monitoring external and internal exposures

Next, Balshaw described activities of the Gene, Environment, and Health Initiative Exposure Biology Program, funded from 2007-2011 to explore whether exposure could be measured in a new manner. The program focused on developing tools for exposure assessment in the personal environment, including monitors for external exposure, using stress metrics and information on abuse of substances, and measuring biological responses.

Involving communities in data collection

The third speaker, Liam O'Fallon of the NIEHS Partnerships for Environmental Public Health (PEPH) program, reported on community engagement activities to explore how the exposome relates to public health work. O'Fallon pointed to one example of how communities can be involved in collecting the necessarily extensive data.

"The Environmental Health Sciences Core Center at Emory University is working with community partners who understand the utility of the exposome," he explained.

As part of the Environmental Health Chat series, PEPH recently released a podcast that explains the concept of the exposome and how it can help community organizations address their environmental health concerns.

Listen as Gary Miller, Ph.D., of Emory University, and others describe how understanding the exposome can help protect people at a societal level. (6:43)

Listen Now (5MB)

Transcipt (25KB)

Coming soon: workshop and webinars

The exposome faculty's role ranges from providing a forum to discuss and define the exposome concept, to fostering collaborations across NIEHS related to the exposome. Furthermore, plans call for a bimonthly webinar series to begin soon, as well as a workshop later in the year.

Balshaw summed up the role by saying, "The exposome faculty is first and foremost a forum to talk about what the exposome is and what we as an Institute should be doing."

"Many different organizations have observed that there are multiple exposures they have to deal with, but to them it seems scientists look at one exposure and one health outcome," said O'Fallon. "That isn't reflective of their realities. The exposome is an opportunity to more realistically examine environmental justice and environmental health disparities. (Photo courtesy of Steve McCaw)

Richard Kwok, Ph.D., is the lead associate investigator for the GuLF STUDY, mentioned during Longnecker's discussion on exposure data. (Photo courtesy of Steve McCaw)

The work of David Miller, Ph.D., chief of the Toxicology and Pharmacology Laboratory, includes understanding how blood-brain barrier transport function is altered by environmental stressors and disease. (Photo courtesy of Steve McCaw)

Like other scientists in NTP, Darlene Dixon, D.V.M., Ph.D., head of the Molecular Pathogenesis Group, is interested in how exposome science intersects with the studies in her lab. (Photo courtesy of Steve McCaw)

Daniel Shaughnessy, Ph.D., is a Health Scientist Administrator for the NIEHS Exposure Biology Research Program. (Photo courtesy of Steve McCaw)

Scott Masten, Ph.D., director of the NTP Office of Nominations and Selection, is interested in applying exposome research to the prioritization of substances studied by the NTP. (Photo courtesy of Steve McCaw)

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