

Symposium features talks on NIH core support and metabolomic profiling

By Eddy Bal

NIH health scientist administrator Daniel Shaughnessy, Ph.D., led a lineup of eight speakers at the Aug. 22 Metabolomics Symposium with a keynote address on "Metabolomics Studies and Environmental Health: Programs at NIEHS." Shaughnessy discussed capacity building support through the NIH Common Fund [Metabolomics program](http://commonfund.nih.gov/metabolomics/index), (<http://commonfund.nih.gov/metabolomics/index>) which has awarded grants to six regional cores across the U.S.

The event was held at RTI International in Research Triangle Park, North Carolina. It was co-sponsored by the NIH Eastern Regional Comprehensive Metabolomics Resource Core ([RCMRC](http://www.rti.org/page.cfm/Metabolomics_Research)) (http://www.rti.org/page.cfm/Metabolomics_Research) at RTI, headed by Susan Sumner, Ph.D., and the Waters Corporation, which offers analytical system solutions, software, and services for scientists.

The symposium's second keynote speaker, Robert Plumb, Ph.D., director of metabolomics profiling at Waters Corporation and visiting professor of analytical chemistry the Imperial College London faculty of medicine, explored "Metabolomics and Translational Medicine," with a focus on the Medical Research Council (MRC)-National Institute for Health Research (NIHR) [National Phenome Center](http://www1.imperial.ac.uk/phenomecentre/) (<http://www1.imperial.ac.uk/phenomecentre/>) in the U.K.

Linked Video

[Watch a video of the launch of the National Phenome Centre in June 2013 \(06:53\)](#)

The symposium's afternoon session featured talks by six scientists who are collaborating with the core at RTI to conduct ongoing metabolomic profiling studies.

Advancing preventive and personalized medicine

In her opening remarks, [Sumner](http://www.rti.org/newsroom/experts.cfm?obj=1958B5A7-73A2-4C7B-B3502AB6EB5F5AB3) (<http://www.rti.org/newsroom/experts.cfm?obj=1958B5A7-73A2-4C7B-B3502AB6EB5F5AB3>) outlined the potential of what she described as the metabotype - the individual metabolic profile of an organism's functional state or phenotype. Metabotype is based on the results of advanced metabolomic assays of the low molecular weight complements of cells, tissues, and biological fluids.

"Metabotype can correlate with gender, race, age, ethnicity, drug use, chemical exposures, stress, weight status, health status, blood pressure, disease state, and nutritional intake," Sumner said. With quality metabolomic data, this profiling offers the potential for diagnosing disease in its preclinical stages, monitoring personalized treatment to achieve optimal outcomes, identifying environmental exposures, and streamlined drug discovery and clinical trials.

NIH support

As [Shaughnessy](#) told the audience, next-generation metabolomics technologies, such as chromatography-mass spectrometry and nuclear magnetic resonance spectroscopy, have identified more than 20,000 known metabolites, to date. As technology advances, researchers may have the potential to double the number of unique chemical entities, including exogenous metabolites from environmental chemicals, toxins, dietary factors, and drugs.

Because of its tremendous potential across the spectrum of biomedical research, metabolomics has become a high priority for trans-NIH support. The program is dedicated to increasing national capacity for metabolomics studies nationwide with regional metabolomic core programs, training the next generation of researchers, synthesizing reference standards, promoting technology development, and enabling data sharing and international collaborations.

The program goal, Shaughnessy said, is to develop technologies to enable, better, faster, and cheaper approaches for identifying metabolites for public health research.

Applications in biomedical research and translation

[Plumb](http://www.imperial.ac.uk/AP/faces/pages/read/Home.jsp?person=r.plumb&_adf.ctrl-state=9h5x21hg_3&_afRedirect=1668910680688620), (http://www.imperial.ac.uk/AP/faces/pages/read/Home.jsp?person=r.plumb&_adf.ctrl-state=9h5x21hg_3&_afRedirect=1668910680688620) whose role in the Department of Surgery and Cancer at Imperial says much about his dedication to translational medicine, dazzled symposium attendees with his vision of the future of personalized medicine, based on metabolomic profiling and phenome analysis. He began with the 100-100 concept - the goal of achieving 100 years of longevity at 100 percent of optimal health - and offered glimpses into how it can become a reality.

Among many technical developments to come, Plumb pointed to the potential for high-throughput imaging of drug and metabolite distribution in tissues, to monitor individual patient response to treatment. He described an operating theater of the future, where surgeons can access real-time tissue profiling as they perform operations and screen the metabolomic environment for more effective diagnosis than was ever possible with needle biopsy.

The afternoon presentations demonstrated the promise of metabolomics in a number of disease and therapeutic areas, showing how support from the NIH Common Fund Metabolomics program is advancing biomedical research, with implications for prevention, early-stage interventions, and treatment of cancer and other noncommunicable diseases (see [text box](#)).



Sumner spoke with characteristic enthusiasm about the success of the RTI core pilot projects. Hers was one of three cores funded by NIH in the first round of applications for fiscal year 2012. An additional three cores were funded for fiscal year 2013. (Photo courtesy of Steve McCaw)



As Shaughnessy reviewed the history of the NIH Metabolomics program, he said he was impressed by how much progress has been made. "Now we're seeing a lot more data-based research," he said. (Photo courtesy of Steve McCaw)



Plumb described new technology that promises to revolutionize clinical medicine, including the intelligent knife (iKnife) rapid evaporative ionization mass spectrometry for tissue profiling; desorption electrospray ionization mass spectrometry for imaging drug distribution; and augmented reality solutions for complex data visualization. (Photo courtesy of Steve McCaw)



Along with his accomplishments as a computational biologist and visionary, Plumb proved an accomplished stand-up comedian, who flavored his talk generously with witty remarks, keeping the capacity audience engaged and, as often as not, laughing. (Photo courtesy of Steve McCaw)



NIEHS and NTP Director Linda Birnbaum, Ph.D., was one of several institute representatives attending the symposium. (Photo courtesy of Steve McCaw)



Former NIEHS senior fellow Belinsky, center in glasses, took advantage of RTI core pilot funding to expand research funded by the National Cancer Institute using metabolomic profiling. (Photo courtesy of Steve McCaw)

Advancing translational research using metabolomics approaches

For free, and on a fee-for-service basis, researchers can access a range of metabolomic resources at RTI and the other five cores at the University of Michigan, University of Kentucky, University of Florida, Mayo Clinic, and University of California, Davis.

Like its sister cores, the RTI RCMRC also offers [supplementary grants](http://www.rti.org/files/RTI%20RCMRC%20Call%20for%20Applications.pdf) (<http://www.rti.org/files/RTI%20RCMRC%20Call%20for%20Applications.pdf>)

for one-year pilot projects to enhance metabolomics research and translation. The program targets investigators new to the metabolomics field, the development of new teams and partnerships, and high-risk and high-impact research. Recipients included six presenters at the symposium:

- Melinda Beck, Ph.D., The University of North Carolina at Chapel Hill (UNC) - "Metabolomic Profiling of Influenza A: 2009 Pandemic H1N1 in Lean and Obese Mice"
- Delisha Stewart, Ph.D., RTI International - "Metabolomics in Cancer Research"
- Steven Belinsky, Ph.D., Lovelace Respiratory Research Institute - "Metabolomics and Factors for Epigenetic Silencing of Lung Cancer Genes"
- Laura Cox, Ph.D., New York University Langone Medical Center - "Systemic Metabolic Effects of Early-life Microbiota Disruption"
- Snezana Petrovic, M.D., Ph.D., Wake Forest School of Medicine - "Correlation of Urine Metabolomics Profiles with eGFR, ACR, and Dietary Acid Load in Diabetic Patients From the African-American Diabetes Heart Study"
- David Collier, M.D., Ph.D., East Carolina University Brody School of Medicine - "Immersion Treatment for Adolescents With Morbid Obesity: What Does Metabolomics Tell Us About Treatment Failure?"

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