

Duke Integrated Toxicology and Environmental Health Program, Duke University Superfund Center
Fall 2019 Symposium, 8:30 AM – 3:00 PM, Oct 11, 2019, Field Auditorium, Grainger Hall, Duke University
**Bridging Across Levels of Analysis to Advance Neurotoxic Risk Determination:
Toxicology for the Second Fifth of the 21st Century**

Chair: Edward D. Levin, Ph.D., Duke University, Durham, NC, USA,

The 'omics advances over the first fifth of the 21st century have provided a wealth of information for all biological sciences including neurotoxicology. However, determining the biologic meaning of this mass of data is challenging. It is clear that a plethora of data points does not by itself provide useful understanding of neurotoxic risk. The integrated organism, in particular, the highly interconnected brain has many levels of integration and compensation that define biologic risk in addition to incipient chemical impacts on cellular function as catalogued by high throughput in vitro assays. The big data provided by 'omics investigation gains much more value when interpreted in the context of more complex levels of organization. "Toxicology for the 21st Century" was initially thought by some as a way by which the high throughput 'omics approach could index all molecules and all biochemical processes and that from these revolutionary techniques all toxic risks would be determined in a rapid throughput manner. Nearly twenty years into the 21st century this promise remains to be fulfilled. This is not a new experience with scientific revolutions. The invention of the microscope 500 years ago opened our eyes to a previously unknown world of biology, microbes. This revolutionary technique, as valuable as it was and continues to be, did not in a few years (or centuries) rid us infectious disease. Scientific revolutions open new avenues for discovery, but there always remains much more to understand. What is needed is not just more sophisticated high through-put assays and more time, but rather a different approach, one that integrates high throughput testing with the understanding gained from analysis of more complex systems, a spectrum of research approaches. Advancing beyond the hubris that we would with 'omics quickly know everything about everything, we can proceed in a more reasonable fashion to incorporate the fruits of the 'omics revolution together with the investigations on more complex scales to go from facts to understanding of neurobehavioral toxicity. This symposium bring together researchers from a range of complementary approaches from in vitro cell-based assays, to invertebrate research with *C. elegans* and *drosophila*, to zebrafish models, mammalian rodent studies and human epidemiology. The speakers will discuss how their level of analysis can inform and be informed by research by other levels so that we can approach a more comprehensive understanding of neurotoxic risks and solutions for toxicology in the 2nd fifth of the 21st century.

8:30-8:45: Welcome and Introduction

Tamara Tal, Ph.D., US-EPA
Email: Tal.Tamara@epa.gov

8:45-9:15: Developmental computation: in vitro data
and in silico models

Thomas Knudsen, Ph.D., US-EPA
Email: knudsen.thomas@epa.gov

11:30-12:00: Using zebrafish as a complementary
model for neurobehavioral toxicology

Edward D. Levin, Ph.D., Duke University
Email: edlevin@duke.edu

9:15-9:45: Mechanistic studies of PCB effects on
neuronal connectivity in vitro and their relevance
to in vivo developmental neurotoxicity

Pamela Lein, Ph.D., University of California-Davis
Email: pjlein@ucdavis.edu

12:00-1:00: Lunch

1:00-1:30: Mice Examining Parkinson's disease gene-
environment interactions using novel mouse models

Laurie Sanders, Ph.D., Duke University
Email: laurie.sanders@duke.edu

9:45-10:15: *C. elegans* as a model for investigating
gene-environment influences on dopaminergic
dysfunction

Joel Meyer, Ph.D., Duke University
Email: joel.meyer@duke.edu

1:30-2:00: The Translational Value of Rat Models for
Neurobehavioral Toxicology: Problems, Progress,
and Potential

Helen Sable, Ph.D., University of Memphis
Email: hjsable@memphis.edu

10:15-10:30: Break

10:30-11:00: Drosophotoxicology: inroads to
conserved pathways and patterns of neurotoxic
form and function in the developing fly

Matthew Rand, Ph.D., University of Rochester
Matthew_Rand@urmc.rochester.edu

2:00-2:30: Environmental exposures and the
epigenome: A Durham Case study

Catherine Hoyo, Ph.D., North Carolina State
University
Email: choyo@ncsu.edu

11:00-11:30: Examining the mechanisms by which
microbiota and xenobiotics influence
neurobehavioral development in zebrafish

2:30-3:00: Discussion

Linda Birnbaum, Ph.D., NIEHS
Email: birnbaum@niehs.nih.gov