Duke University Superfund Center / Univ. Program in Environmental Health & Toxicology
Fall 2019 Symposium
Friday, October 11, 2019; 8:30 AM – 3:00 PM
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

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 do 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 a bit more time; rather a different approach is necessary, 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 will bring together researchers from a range of complementary approaches to neurotoxicology across a spectrum of scales from in vitro cell-based assays, to invertebrate research with C. elegans and drosophila, vertebrate aquatic zebrafish models, mammalian rodent investigations to human epidemiological and clinical studies. The speakers will discuss how research on 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.

Schedule

8:30-8:45: Welcome and Introduction

8:45:9:15: In vitro: Screening
Thomas Knudsen, Ph.D., U.S. EPA

9:15-9:45: In vitro: Mechanistic
Pamela Lein, Ph.D., University of California-Davis

9:45-10:15: C. elegans
Joel Meyer, Ph.D., Duke University

10:15-10:30: Break

10:30-11:00: Drosophila
Matthew Rand, Ph.D., University of Rochester

11:00-11:30: Zebrafish Mechanistic
Tamara Tal, Ph.D., U.S. EPA

11:30-12:00: Zebrafish: Behavioral Function
Edward D. Levin, Ph.D., Duke University

12:00-1:00: Lunch

1:00-1:30: Mice
Laurie Sanders, Ph.D., Duke University

1:30-2:00: Rats
Helen Sable, Ph.D., University of Memphis

2:00-2:30: Epidemiology
Cathrine Hoyo, Ph.D., NC State University

2:30-3:00: Discussion
Linda Birnbaum, Ph.D., NIEHS