



Editorial

Neural mechanisms of functional impairment across the lifespan



The 15th Biennial Meeting of the International Neurotoxicology Association and 39th Annual Meeting of the Neurobehavioral Teratology Society

In the early years of the International Neurotoxicology Association (see [Costa, 2013](#)) research aimed at unraveling the biological mechanisms underlying the severe, sometimes clinical, neurobehavioral phenotypes observed in children and adults environmentally and occupationally exposed to various neurotoxic chemicals, such as lead, methylmercury, organic solvents, or pesticides ([Baker and Seppalainen, 1986](#); [Bellinger and Stiles, 1993](#); [Grandjean et al., 1995](#)). This goal is reflected in the INA statutes that state the "...purpose of the Association is to promote scientific knowledge regarding the action of toxic agents on the nervous system..." Thus, the evidence-based prevention of adverse health effects in humans by understanding cellular and molecular mechanisms of neurotoxicity has been a major focus of many biannual INA meetings, long before it was proposed in the toxicology vision statement issued by the National Research Council in 2007 ([Council, 2007](#)). Epidemiological data, as well as mechanistic animal and *in vitro* studies often addressing the same compound (e.g. pesticides) comprised the scientific program of all previous INA meetings (e.g. [Lein et al., 2012](#)). The scientific output of these meetings is documented in numerous Special Issues of this journal. When INA celebrated its 25th anniversary in 2013 with the 14th biannual meeting in Egmond aan Zee, The Netherlands ([Llorens et al., 2014](#)), the scope of neurotoxicological research presented at the meeting expanded to address less obvious cause-effect relationships where for instance perturbations of biological events earlier in life by neurotoxic chemicals might contribute to the development of neurodegenerative diseases ([Hayden et al., 2010](#)). New technical developments like "omics"-technologies and new biostatistical tools as well as the increasing knowledge of how other organs (e.g. lung, gut) influence nervous system development and functioning were also addressed.

This expanded spectrum of topics was reflected in the scientific program of INA-15. The overall theme of INA-15 "Neural mechanisms of functional impairment across the lifespan" included recent developments within the scientific community that align perfectly with the original mission of INA. The scientific environment of INA-15 was further enhanced by hosting a joint meeting with the Neurobehavioral Teratology Society (NBTS), now called the Developmental Neurotoxicology Society (DNBS). From June 27th until July 1st 2015, members and friends of the International Neurotoxicology Association (INA) came together for their biannual meeting in Montréal, Quebec, Canada. Researchers

from all continents (except Antarctica) participated, reflecting that INA is really an international society. More than 170 participants from both societies registered for the INA/NBTS meeting and enjoyed the wonderful city of Montréal and excellent science at the meeting venue. The common scientific interest of these two groups was evident by six co-sponsored symposia that were mutually organized by INA and NBTS scientists, which included symposia addressing flame retardants, complementary models, psychiatric disease, adverse outcome pathways, microbiomes and epigenetics. To ensure discussion of state-of-the-art science, internationally renowned experts were invited to contribute to the joint symposia. Additional recent developments in neurotoxicology and developmental neurotoxicology were presented in three NBTS and five INA symposia during the five meeting days. Several of these symposia were financially supported by the NIEHS, EPA, CAAT Europe and Axion Biosystems as well as by the Superfund Basic Research Program for trainee travel. Each society also organized several platform sessions to cover hot topics emerging from the submitted abstracts. The scientific outcome of the meeting is now published in this special issue of *Neurotoxicology*, while the whole scientific program, the abstracts, as well as some session summaries have been published in *Neurotoxicology and Teratology*. In addition to the oral sessions, more than 50 posters were presented during the poster session on Monday evening that also included drinks and the traditional Canadian Dish *Poutine*. Thanks to a generous donation from Elsevier B.V., three post-docs and two students were awarded with poster prizes. To showcase the research of young academics, INA organized for the second time the David Ray Student Symposium. Three PhD students were pre-selected to present their work during this session. The talk by Johanna Nyffeler, PhD student from the Laboratory of Marcel Leist at the University Konstanz (Germany), was awarded with the David Ray Student Award. Many thanks to the various INA members that served as judges for the poster evaluation and the David Ray Award.

Additional highlights of the scientific program included two keynote lectures given by outstanding researchers in neuroscience. Prof. Barbara Sahakian (University of Cambridge, UK) gave the INA 2015 Jacob Hooisma Lecture with an exciting talk entitled "The objective measurement of drug and environmental influences on brain functions". Prof. Sahakian is one of the most cited researchers in neuroscience and co-inventor of the CANTAB (Cambridge

Neuropsychological Test Automated Battery). This neurobehavioral test battery has been proposed to be used in neurotoxicology (Fray and Robbins, 1996). The second keynote lecturer, John F. Cryan (University College Cork, Ireland), who was the NBTS Elsevier Distinguished Lecturer, talked about the “Microbiota-gut-brain axis: From neurodevelopment to behavior”. All attendees were fascinated by these comprehensive overviews provided by these entertaining speakers.

This special issue of INA-15 once again documented that INA is an international association and scientifically heterogeneous society. In 14 scientific papers researchers from five continents provide insights into (a) the neurotoxicity of air pollution, (b) developmental neurotoxicity *in vivo*, including some translational work, (c) *in vitro* techniques to provides data for risk assessment and basic research, including a conceptual paper about adverse outcome pathways (AOPs), and (d) new methods and mechanism for the assessment and explanation of neurotoxicity in humans.

Our scientific journey will be continued in 2017! The 16th Biennial Meeting of the International Neurotoxicology Association will take place in Florianopolis (Brazil) from May 20th to the 24th. For the first time, INA will meet in South America and due to the success of the co-hosted program in Montreal, we will host this meeting in collaboration with the Neurotoxicity Society (NTS). All dates and details can be found on our website (www.neurotoxicology.org).

We hope to see you there!

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