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## NeuroToxicology



### Editorial

# Neurodevelopmental basis of health and disease The 14th meeting of the International Neurotoxicology Association

Biological events in early life are key determinants of health status in adult and aging stages. The evidence for this is compelling in neurotoxicology (Grandjean and Landrigan, 2006). The complexity of the developing nervous system creates multiple targets for the adverse structural, functional and behavioral effects of toxic chemicals: from overt neuroteratogenia to subtle influences on the functional decline occur during aging. Minamata disease is the best known example of dramatic alterations in nervous system structure and function as a result of chemical exposure during development. However, the impact of low dose exposure of several other toxic compounds on endpoints such as adolescent emotional growth, cognitive function, sensory deficits or risk of suffering neurodegenerative diseases (Grandjean and Landrigan, 2006; Cannon and Greenamyre, 2011; Bellinger, 2013) is a field of knowledge that still contains more questions than answers. The effects of toxicants on later life become more and more important as life expectancy increases. In addition to understanding the effects and underlying mechanisms, we want to predict the adverse effects on the developing nervous and sensory systems. This constitutes a major challenge for neurotoxicity testing. Facing these questions, the International Neurotoxicology Association (INA) selected the theme “Neurodevelopmental Basis of Health and Disease” for its 14th Meeting, held in Egmond aan Zee, The Netherlands, June 2013. Detailed information on the meeting, including lists of symposia, members of the organizing and scientific committees, awardees, sponsors, and exhibitors are included elsewhere in this Special Issue (De Groot et al., 2014).

Beyond the conference theme, the opening ceremony of the meeting, conducted by Dr. Jordi Llorens (President of INA) and Dr. Didima de Groot (Chair of the Local Organizing Committee), focused on INA history, which was recently reviewed (Anger and Boyes, 2012; Costa, 2013). The first INA Meeting took place in Lunteren, The Netherlands, in 1987, so the present meeting represented the 25th INA anniversary and it was back in The Netherlands. Throughout these years, INA has grown and served its main goals: to foster interest in neurotoxicology, and to attract and retain new young scientists. Although new and younger members have joined INA, we lost many of the founders and early members. At INA 14, a particular tribute was devoted to Dr. Toshio Narahashi, who recently passed away, to Dr. David Ray, who died in 2010, and to Dr. Jacob Hooisma, who led the organization of the first INA meeting and to whom the opening lecture of INA Meetings is named. To remember Jacob, his widow Teunie and his TNO colleagues from the early days of neurotoxicology, Hans Muijser,

Wim Stevens, Bert Bierman, and Beverley Kulig, were welcomed as honorary guests at the opening ceremony and lecture. Dr. Narahashi (1927–2013) will be remembered as a outstanding scientist among INA members, the one who opened a new era in the study of cell physiology with his key discovery of the blockade of sodium channels by tetrodotoxin in 1964, and who always remained an active INA member (see his obituary by Cranmer, 2013). David Ray greatly contributed to INA, as one of its first members, editor of its newsletter, President 2007–2009, organizer of INA-7 in 1999, and tireless promoter of INA (Burr, 2011; Costa, 2013). To honor him, we named the Student Travel Award after him, which covers all the travel expenses for one student presenting his/her work at the meeting on the basis of scientific merit.

Dr. Niek Snoeij (Director TNO Healthy Living, The Netherlands) introduced Dr. Peter Spencer (Oregon Health & Science University, USA) as this year’s Hooisma lecturer. His lecture, entitled ‘Neurotoxin Discovery and Disease prevention’, perfectly fit both the scientific theme and historical aim of the session. As one of the founding members of INA and a still excellent and active neurotoxicologist, Dr. Spencer reviewed both the old days when, along with Jacob and many others, he worked on the *n*-hexane axonopathy, and his recent studies on the possible role of early methylazoxymethanol exposure on neurodegeneration that occurs decades after exposure (Kisby et al., 2013).

The meeting welcomed all areas of neurotoxicology, but the scientific program placed a particular emphasis on its main theme. The Scientific Committee, whose members are listed elsewhere in this issue, selected a dense and highly exciting program of 9 symposia from the numerous proposals received. These included *in vitro* and *in vivo* developmental neurotoxicology, neurodegeneration and neuroprotection issues. The lectures were given by established and emerging leaders in neurotoxicology and covered many classes of toxicants, including air pollutants, pesticides, metals and model neurotoxins. The program also featured two student symposia: fulfilling one of INA’s aims to recruit and motivate young investigators to pursue careers in neurotoxicology. The students were selected from a larger list of applicants for partial reimbursement of their travel expenses. One of them, Anne Krug (University of Konstanz, Germany), received the David Ray Student Travel Award. It is worth noting that the jury of the award had a very difficult task, as all student presentations were excellent. The additional poster sessions and “hot topic symposium” ensured that the meeting featured many topics that reflect

the depth and extent of on-going neurotoxicological research from around the globe. Even though the poster sessions were scheduled for late afternoon/early evening, they were visited by most attendees, including senior neurotoxicologists, mentors and students. Very lively discussions were observed. Three young scientists received an award for their poster presentations. The hot-topic session included six presentations selected from the abstracts submitted as highly interesting topics not covered in the other symposia. This session reached its goals of novelty and interest, and was appreciated by the conference attendees.

The meeting schedule aimed at providing opportunities for networking and friendship. Posters and exhibitors shared the same hall, and catering services were offered in the session breaks. This facilitated the lively atmosphere that was one of the main successes of the meeting. Attendants also met for the social program of the meeting, which included a boat tour through the canals of Amsterdam with lunch on board, followed by a guided walking tour through the city. The tour ended in a typical Dutch “Bruin Café” with a drink and accordion music for a typical Amsterdam atmosphere. In addition, INA’s traditional soccer match was held at the beach of Egmond aan Zee, and was followed by a beach barbeque. Along the years of INA meetings, these activities have proven to be very successful at creating and strengthening links between neurotoxicologists, which have resulted in increased scientific collaboration and emergence of ideas. The relaxed atmosphere dissipates country boundaries as well as age and job status.

The meeting was also highly successful regarding the organization aspects. To get everything running smoothly, the Local Organizing Committee, composed of Drs. Jan Lammers, Remco Westerink, and Didima de Groot, and assisted by INA’s Past-President, Dr. Donald A. Fox, had the professional assistance in the conference secretariat of Mrs. Helena Bastiaanse of Bastiaanse Communication (Bosch en Duin, The Netherlands). Her experience and dedication to make this conference a success were recognized by the organizers and highly appreciated. The organizers also are very grateful to the individuals that joined them in the task of fundraising for the meeting. These were Drs. Michael Aschner, William K. Boyes, Kevin M. Crofton, Carey Pope, Anna Price, and Wei Zheng. Special thanks are due also to the companies and organizations that contributed with funds to the meeting, as listed elsewhere in this issue.

At the close of the 14th INA meeting, work is in progress for the organization of the 15th INA meeting to be held in Montreal (Canada). Current INA President, Dr. Christoph van Thriel (2013–2015) and the Chair of the Local Organizing Committee, Dr. Edward D. Levin, have the responsibility of making this next meeting a new success of this grown up Association. Even in these difficult economic times for science, we look forward to a bright future of the INA and the science of neurotoxicology.

#### Conflict of interest

The authors declare that there are no conflicts of interest.

#### Transparency document

The [Transparency document](#) associated with this article can be found in the online version.

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#### References

- Anger WK, Boyes WK. A brief history of INA and ICOH SCNP: international neurotoxicology association and international congress on occupational health scientific committee on neurotoxicology and psychophysiology. *Neurotoxicology* 2012;33:631–40.
- Bellinger DC. Prenatal exposures to environmental chemicals and children's neurodevelopment: an update. *Saf Health Work* 2013;4:1–11.
- Burr S. Obituary—David Ray. *Neurotoxicology* 2011;32:169.
- Cannon JR, Greenamyre JT. The role of environmental exposures in neurodegeneration and neurodegenerative diseases. *Toxicol Sci* 2011;124:225–50.
- Costa LG. The birth and early years of INA, the International Neurotoxicology Association. *Neurotoxicology* 2013;36:89–103.
- Cranmer JM. A memorial to Toshio Narahashi, PhD: an international leader of neurotoxicology and the father of cellular neuropharmacology. *Neurotoxicology* 2013;37:134–5.
- De Groot DMG, Westerink RHS, Iamers JHCM, Fox DA, van Thriel C, Llorens J. Meeting Report. Neurodevelopmental basis of health and disease. The 14th Meeting of the International Neurotoxicology Association. *Neurotoxicology* 2014 (in this issue).
- Grandjean P, Landrigan PJ. Developmental neurotoxicity of industrial chemicals. *Lancet* 2006;368:2167–78.
- Kisby GE, Moore H, Spencer PS. Animal models of brain maldevelopment induced by cycad plant genotoxins. *Birth Defects Res C Embryo Today* 2013;99:247–55.

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