# Introduction: Endocrine Disruptors—Exposure Assessment, Novel End Points, and Low-Dose and Mixture Effects

***Andreas Kortenkamp***

The School of Pharmacy, University of London, Centre for Toxicology, London, United Kingdom

*Environ Health Perspect* 115(suppl 1):7 (2007).
doi:10.1289/ehp.10517 available via *http://dx.doi.org/* [Online 8 June 2007]

With the aim of discussing new research findings about chemicals able to interfere with the endocrine system, so-called endocrine disruptors, an international workshop was held in Prague, Czech Republic, 10–12 May 2005. The workshop was organized jointly by the EDEN project (Endocrine Disrupters: Exploring Novel Endpoints, Exposure, Low-Dose and Mixture-Effects in Humans, Aquatic Wildlife and Laboratory Animals; http://www.edenresearch.info) and the FIRE project (Risk Assessment of Brominated Flame Retardants as Suspected Endocrine Disrupters for Human and Wildlife Health; http://www.rivm.nl/fire), both large-scale consortia funded by the European Union (EU). The meeting was attended by more than 170 scientists from academia, industry, government agencies, and other organizations.

EDEN and FIRE were part of the CREDO cluster (Cluster for Research on Endocrine Disruption), an umbrella organization of more than 60 EU-funded laboratories working on endocrine disruptors. Together with the COMPRENDO (Comparative Research on Endocrine Disruption) and the EURISKED projects (Multi-organic Risk Assessment of Selected Endocrine Disruptors; http://www.eurisked.org), EDEN and FIRE formed the core of the cluster. CREDO served as a platform for cooperation and exchange between its constituent projects. With the completion of almost all its member projects, CREDO has recently ceased to exist, but information about the cluster is still available on online (http://www.credocluster.info).

The Prague workshop was the last in a series of meetings organized under the auspices of the CREDO cluster. The themes of previous workshops were risk assessment and the ecologic relevance of chemically induced endocrine disruption in wildlife (Jobling and Tyler 2006).

This monograph contains papers presented at the Prague workshop and follows the session structure of the meeting, focusing on four main topics:

- "Indicators of Human and Wildlife Exposure to EDCs " reports on new findings relating human exposure to endocrine disruptors in Europe to reproductive disorders, including cryptorchidism, hypospadias, and semen quality. New information about exposure trends for brominated flame retardants in freshwater and marine ecosystems is also given.
- "Novel models, end points, and biomarkers" summarizes research on the effects of endocrine disruptors on steroid-metabolizing enzymes and gives new data on alkylphenols as endocrine disruptors. Additional articles focus on the consequences of prolonged phytoestrogen exposure for reproductive organs and the outcomes of *in utero* exposure to endocrine disruptors for testicular dysgenesis, prostate development, and the thyroid hormone axis.
- "Low-dose effects of endocrine disruptors" gives a synthesis of recent observations in *in vitro* systems and highlights the importance of statistical power considerations in resolving the low-dose issue.
- "Mixture effects of endocrine disruptors and their assessment" contains reviews of combination effects, assesses the implications of low-level exposure to multiple chemicals and describes the joint effect of endocrine disruptors in fish and in a developmental toxicity rat model.

Taken together, the articles presented in this monograph capture a great deal of the lively debates that took place during the Prague workshop and within the CREDO cluster as a whole. The workshop made considerable progress toward answering key questions that were unresolved a few years ago. It has also stimulated a consensus statement among scientists actively engaged in research in this field, the "Prague Declaration on Endocrine Disruption." The Prague Declaration, also published as part of this monograph (available as Supplemental Material online at http://www.ehponline.org/docs/2007/10517/suppl.pdf ), summarizes issues upon which the majority of scientists can agree, outlines research priorities for the next decade, and highlights steps that can be taken today to prevent health risks to humans and wildlife. It has been signed by more than 200 scientists from all over the world.

All contributors to the workshop are thanked cordially. Without their enthusiasm and hard work the meeting and this monograph would not have happened.

## Reference

Jobling S, Tyler CR (eds). 2006. The Ecological Relevance of Chemically Induced Endocrine Disruption in Wildlife. Environ Health Perspect 114(suppl 1):1–160.

This article is part of the monograph "Endocrine Disruptors—Exposure Assessment, Novel End Points, and Low-Dose and Mixture Effects."

Supplemental material is available at http://www.ehponline.org/docs/2007/10517/suppl.pdf

The author declares he has no competing financial interests.

Received 30 May 2007; accepted 4 June 2007.