

Developmental Origins of Environmentally Induced Disease and Dysfunction

International Conference on Foetal Programming and Developmental Toxicity
Tórshavn, Faroe Islands, 20–24 May, 2007

Foetal and early postnatal development likely constitutes the most vulnerable time period of human life, in regard to adverse effects of environmental hazards. Subtle effects during early life can lead to functional deficits and increased disease risks later in life. The programming hypothesis (i.e. that early development determines subsequent organ functions and disease risks), has gathered much support from both experimental and epidemiological studies. The prenatal and early postnatal environment affects gene expression, and epigenetic changes may constitute an important mechanism for the programming effects. All of this information suggests that the timing of exposure to environmental chemical is crucial in determining the toxicity effects. These important insights are likely to be of importance for new research in environmental health and related fields, and for health promotion and prevention purposes.

An international conference was therefore organized to review the current research frontline and stimulate cross-disciplinary research and collaboration in regard to developmental programming caused by environmental chemical exposures. The meeting was held on 20–24 May 2007, and the venue was the Nordic Conference Centre in Tórshavn, the capital city of the Faroe Islands. Over 120 scientific papers were presented, half of them as lectures. All abstracts and most of the posters are available at the conference website (www.pptox.dk). The invited speakers have contributed the manuscripts that are included in this *Basic & Clinical Pharmacology & Toxicology* (BCPT) issue.

In addition to devising the conference programme, the international scientific committee drafted a summary document to reflect the current knowledge in this field and to highlight conclusions and recommendations. Following discussions among the 200 participants and revisions during the conference, the scientific committee finalized the document as the Faroes Statement (also included in this BCPT issue).

The conference discussed three important aspects of children's health in conjunction with developmental toxicity risk:

- the developmental perspective, which considers the risks during different developmental stages, from preconception to adolescence;
- the environmental perspective, which considers the types of risks that children and the foetus may face in different settings; and
- the disease perspective, which considers the pathogenesis from its initiation and the etiological role played by environmental hazards.

These three viewpoints clearly illustrate the multidisciplinary research issues involved. Developmental programming may also be approached from the standpoint of organ system development and vulnerability. The central nervous system, the

cardiovascular system, the endocrine system and the immune system seem to be particularly vulnerable to adverse effects during development. Likewise, specific diseases, such as particular cancer forms, may well be initiated before birth or during early postnatal life.

The conference demonstrated that developmental programming is a crucial issue to consider in research and prevention, for five reasons:

- 1 There are critical periods of foetal development. Effects of chemical, physical and biological influences will differ, often dramatically, depending on the timing of exposure.

- 2 Foetal programming produces long-term and typically permanent changes.

- 3 While maternal, foetal and placental mechanisms compensate for disturbances in the foetal environment, compensation may also produce secondary (typically negative) effects.

- 4 Continued postnatal exposure and compensation may have further deleterious effects.

- 5 Effects of the environment on the foetus are often different from those on adults or even infants, and the effects may differ between males and females.

Perhaps the inspiring atmosphere at the conference was stimulated by the choice of venue. The Faroe Islands are widely known as an epidemiological setting. Panum first described in 1846 a measles epidemic that affected all residents younger than 65 years, who had not been affected by the previous epidemic. Later achievements by international researchers included the demonstration of multiple sclerosis in the Faroes as a new disease that emerged after the placement of British troops during World War II. Most recently, this community has become known for extensive birth cohort studies that have examined the adverse effects of seafood contaminants on brain development.

We believe that the thriving research area of developmental programming is likely to expand further in the future, with substantial implications for public health. Our conference and these proceedings will hopefully help set the stage for future accomplishments in this field.

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