# Biological activity conferred by endocrine disrupting chemicals in hospital effluent and river water from the Brussels region, Belgium

KERSTEN VAN LANGENHOVE[1], TIM REYNS[2], TARA VANDERMARKEN[1], PIERRE SERVAIS[3], MICHAEL S. DENISON[4], JORIS VAN LOCO[2] & MARC ELSKENS[1]

[1] Vrije Universiteit Brussel, Analytical & Environmental Geo-Chemistry, Pleinlaan 2, 1050 Brussels, Belgium, kavlange@vub.ac.be
[2] Scientific Institute of Public Health, Juliette Wytsmanstraat 14, 1050 Brussels, Belgium
[3] Université Libre de Bruxelles, Ecologie des Systèmes Aquatiques, Campus Plaine, CP 221, 1050 Brussels, Belgium
[4] University of California Davis, Department of Environmental Toxicology, One Shields Avenue Davis, CA 95616, USA

Endocrine disrupting chemicals (EDCs) are gaining in worldwide attention due to their omnipresence, wide range in chemical properties and possible effects on wildlife populations. Problems surrounding these EDCs are their continuous release into the environment through industrial, domestic and hospital effluents and inefficient removal by wastewater treatment plants (WWTPs). For this reason, the Water Framework Directive (WFD, amended in 2013/39/EU) established a priority list of 33 new and 8 previously regulated chemical pollutants, some of which have shown to exhibit endocrine disrupting potential (octyl-, nonylphenol, DEHP, …). Additionally, 15 compounds were also placed onto a watch list containing estrogen compounds (estradiol, ethinylestradiol).

Rather than looking solely for concentrations of targeted and well-known EDCs, this project strives to combine bio-analytical and chemo-analytical data on the Zenne river crossing Brussels and hospital effluents (a potential major source for EDCs due to high consumption of pharmaceuticals and personal care products) for the first time. Bioassays allow scientists to use in vitro receptor models to assess endocrine activity by comparing the mixture or cocktail effect originating from the sample extract. Added value is that this technique picks up effects from compounds that are not routinely monitored in targeted chemo-analytical methods and can detect them at low amounts (pg/L EEQ, Estrogen EQuivalence).

The bioassay used in this study is the CALUX (Chemically activated luciferase gene expression) bioassay using a luciferase reporter gene as part of BG1luc4E2 cells (human ovarian adenocarcinoma). Responses are time, dose, and ligand specific using 17β-estradiol (the natural female hormone) as reference compound. Water samples were taken as grab samples over various locations upstream and downstream of the Zenne River and in a hospital nearby; 24h composite samples were collected in Brussels WWTP South (in- and effluent). Samples were filtered and extracted using Oasis HLB SPE columns.

Values ranged from 0.77 to 1.85ng EEQ/L for the Zenne river water, 98ng EEQ/L for hospital effluent and, respectively, 52.3 and 1.2ng EEQ/L for WWTP influent and effluent. For comparison reasons, commercial drinking waters amount to 0.004-0.070 ng EEQ/L. These results indicate that effluent values are high post-discharge of human activities, EDCs are only partially removed by processes in WWTPs, and that the effluents contribute significantly to EDC loads in the Zenne river.

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