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Detection of biologically active endocrine disrupting chemicals in water sources and the potential health hazards of these contaminants

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Abstract

There is a growing interest in the health risk posed by endocrine-disrupting chemicals (EDCs) in water, food, and consumer products. EDCs interfere with normal function of the endocrine system and have been associated with developmental defects, metabolic disorders, immune dysfunction, and cancer.

Traditionally the detection of EDCs in the environment relies on a laborious analysis of chemical structures using HPLC, MS/GS and related technologies. These methods are costly, time consuming and frequently do not lead to identification of a specific chemical structure as many chemicals are subjected to bio-modifications in the environment. These derivatives cannot be easily identified and are not present in the currently existing chemical libraries. Consequently, their levels are not efficiently monitored or regulated. In addition, it is unclear whether the EDCs detected by chemical methods elicit biological responses in mammalian systems.

To overcome these obstacles, we developed a high-throughput assay for biological testing of EDCs using mammalian cell lines expressing GFP-tagged nuclear steroid receptor constructs. This assay is based on translocation of a fluorescent marker from the cytoplasm to the nucleus in the presence of the hormone or EDCs acting on this particular receptor. Using this cell-based assay we detected androgen activity in 35% of the tested water samples, and a previously unrecognized glucocorticoid (GC) activity in 27% of the samples (Stavreva et al., Sci. Rep. 2012).

Unpublished data on contamination of water sources with other classes of EDCs and the potential implication of this contamination for human health will be discussed.

Biography

Diana A. Stavreva has completed her PhD at the Bulgarian Academy of Sciences in 1998. In 2001 she became a postdoctoral fellow at the NCI and studied nuclear receptor-regulated transcription and receptor dynamics in live cells. In 2006 Diana became a research fellow in the laboratory of Dr. G. Hager (NCI) and a staff scientist in 2011. While continuing her work on dynamic transcription regulation she initiated a study on endocrine disrupting chemicals (EDCs). She uses a novel high-throughput fluorescence-based cell assay for biological testing of EDCs and is currently investigating contamination of water sources with various classes of EDCs.