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Screening for Endocrine Activity in Water Using Commercially-available *In Vitro* Transactivation Bioassays

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ABSTRACT

In vitro transactivation bioassays have shown promise as water quality monitoring tools, however their adoption and widespread application has been hindered partly due to a lack of standardized methods and availability of robust, user-friendly technology. In this study, commercially available, division-arrested cell lines were employed to quantitatively screen for endocrine activity of chemicals present in water samples of interest to environmental quality professionals. A single, standardized protocol that included comprehensive quality assurance/quality control (QA/QC) checks was developed for Estrogen and Glucocorticoid Receptor activity (ER and GR, respectively) using a cell-based Fluorescence Resonance Energy Transfer (FRET) assay. Samples of treated municipal wastewater effluent and surface water from freshwater systems in California (USA), were extracted using solid phase extraction and analyzed for endocrine activity using the standardized protocol. Background and dose-response for endpoint-specific reference chemicals met QA/QC guidelines deemed necessary for reliable measurement. The bioassay screening response for surface water samples was largely not detectable. In contrast, effluent samples from secondary treatment plants had the highest measurable activity, with estimated bioassay equivalent concentrations (BEQs) up to 392 ng dexamethasone/L for GR and 17 ng 17β-estradiol/L for ER. The bioassay response for a tertiary effluent sample was lower than that measured for secondary effluents, indicating a lower residual of endocrine active chemicals after advanced treatment. This protocol showed that in vitro transactivation bioassays that utilize commercially available, division-arrested cell "kits", can be adapted to screen for endocrine activity in water.

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