



Technology Summary

NCI scientists at the Laboratory of Receptor Biology and Gene Expression have developed a novel assay methodology for detecting endocrine disrupting chemicals (EDCs) in contaminated water through fluorescently labeled nuclear steroid receptor constructs in a high-throughput, mammalian cell-based format. This assay methodology has the ability to detect very low concentrations of EDCs in water, wastewater or other liquid samples. This technology fulfills the unmet need for a high throughput, rapid method for screening multiple water samples for contaminants with potential endocrine disrupting activity. NCI seeks licensees or co-development partners to develop this technology into a product or service that detects and screens for EDCs in water samples from a wide variety of sources.

Figure 1: Visual Summary

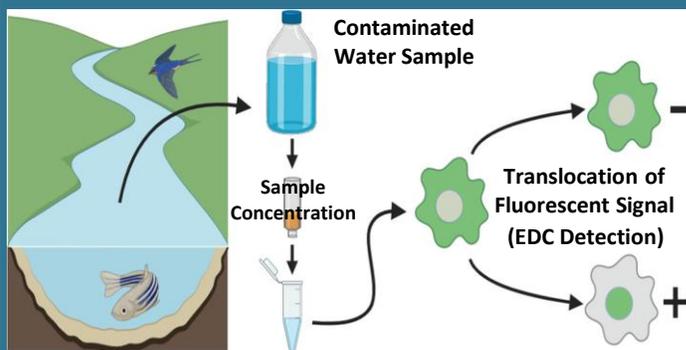


Fig. 1. This technology leverages cell lines expressing fluorescent chimeric constructs capable of detecting environmental contaminants that interact with multiple nuclear receptors: androgen (AR), glucocorticoid (GR), estrogen (ER), aryl hydrocarbon (AhR), progesterone (PR) and thyroid hormone (TR) receptors. In uninduced states, these nuclear receptors are cytoplasmic, however upon binding by antagonists or agonists, they translocate into the nucleus. These cells are exposed to a water (or other liquid sample) and the activation of the nuclear receptor by EDCs results in the translocation of fluorescent signal which can be measured/quantified.

Figure 2: Map

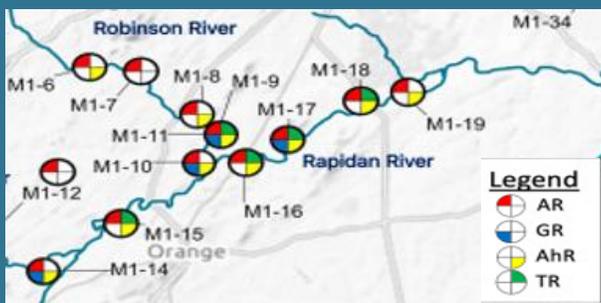


Fig. 2. Water samples from major Virginia rivers from 2016-2018 were screened for EDCs using this technology. The map shows examples of locations samples were collected from and which EDC classes were identified in such samples (color indication for AR (red), GR (blue), AhR (yellow) and TR (green)). Among 45 tested sites: >70% had AR activity, 60% had AhR activity, and many were positive for GR (22%) and TR activation (42%). Some sites were positive for more than one type of EDC.

Intellectual Property

Issued Patents: US & JAPAN

U.S. Patent No. 9,040,248
 U.S. Patent No. 9,921,211
 JP Patent No. 6546311
 JP Patent No. 6388575
 IP Expiration (06/06/2033)

Publications

- [PMID: 33510451](https://pubmed.ncbi.nlm.nih.gov/33510451/)
- [PMID: 32018941](https://pubmed.ncbi.nlm.nih.gov/32018941/)
- [PMID: 23226835](https://pubmed.ncbi.nlm.nih.gov/23226835/)
- [PMID: 31566444](https://pubmed.ncbi.nlm.nih.gov/31566444/)



Figure 3: Translocation of Receptors

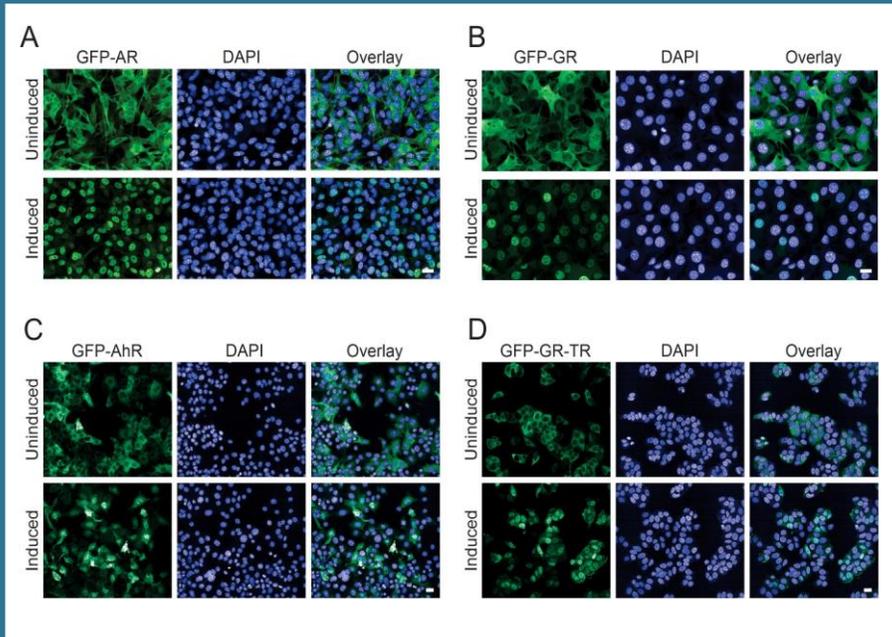


Fig. 3. Representative micrographs showing translocation of the GFP-tagged chimeric constructs in the presence of their respective ligands (100 nM of Testosterone, Dexamethasone and T3 for GFP-AR, GFP-GR and GFP-GR-TR, respectively and 2500 nM CAY 19465 for the GFP-AhR-expressing cells). Scale bar 20 μ m.

Competitive Advantages

- High-throughput and rapid testing
- High sensitivity and selectivity
- Readily adaptable for use with a variety of endocrine receptor targets
- Can detect many EDC variants modified in the environment or other compounds that may act and interfere like EDCs
- Does not require a prior knowledge of the ligand chemical structure

Market Opportunity

Strong Market Demand:

- Endocrine disruptors Analysis Services: \$1.2 B in 2024
- Water Quality Monitoring Systems Market: \$5.67 B in 2024

Factors Driving Market Growth:

- Growing global concern and awareness about EDCs/ Increased focus on environmental sustainability/ More regulations in place
- Significant need for accurate and efficient methods of detection/ monitoring Increased resources and technologies for detection methods
- Growth in related illnesses

Sources:

Comprehensive review of emerging contaminants: Detection technologies, environmental impact, and management strategies – ScienceDirect
<https://www.verifiedmarketreports.com/product/endocrine-disruptors-analysis-service-market/>
<https://www.grandviewresearch.com/industry-analysis/water-quality-sensor-market-report>
https://www.oecd.org/en/publications/endocrine-disrupting-chemicals-in-freshwater_5696d960-en.html