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RAPID IMMUNOCHROMATOGRAPHIC ASSAYS FOR THE SENSITIVE DETECTION OF EDCs IN WASTEWATER

Timothy L. Vail*, Catherine R. Propper, Brian Searcy, Silke Buschmann

ABSTRACT: One of the challenges facing the analysis of endocrine-disrupting compounds in water and wastewater systems is the requirement for lab-based analytical equipment. Separating complex mixtures of compounds through gas or liquid chromatography, followed by molecular identification via mass spectrometry or IR is costly, labor intensive, and relatively slow. Alternatively, a rapid, field-based analysis can lack the required specificity or sensitivity for compounds known to have estrogenic effects in the parts-per-trillion range. There is an unmet need for a diagnostic assay platform that is rapid (less than 10 minutes to completion), sensitive, field-portable, and cost-effective. Immunochromatographic assays show strong potential to overcome several significant limitations of other methods, and provide many of the desirable attributes of both field-based and lab-based analysis systems. We are developing a series of rapid immunochromatographic assays for endocrine-disrupting compounds that utilize high surface reflectance nanoparticles (e.g. colloidal gold) or semi-conducting nanocrystals (e.g. quantum dots) as signal indicators in this diagnostic platform. We currently have the capability to detect 300 ppt estradiol in water, and are optimizing the assays to perform at lower ranges. In order to make these assays useful in a field setting, quantitative and qualitative analysis will require an optical detection system that is more sensitive and objective than the human eye, and can process signal data by ratio comparison. We therefore plan to develop a diagnostic reader and radial cassette assembly with integrated assays. Multiple strip tests, each with unique specificity, will be used in conjunction with the optical detector to create diagnostic panels of assays. The cassette will allow a single water sample under 5 mL to be analyzed for up to eight compounds simultaneously. Recent results and future directions for this project will be discussed.

***** Associate Professor, Northern Arizona University, P.O. Box 5698, Flagstaff, AZ 86011, USA, Phone: 928-523-8893, Fax: 928-523-8111, Email: Timothy.Vail@nau.edu