BIO‑NANOPATTERNING: INKJET PRINTED NANOPATTERNED APTAMER‑BASED SENSORS FOR IMPROVED OPTICAL DETECTION OF FOODBORNE PATHOGENS

Lia Stanciu, Materials Engineering, Purdue University
lstanciu@purdue.edu
Susana Diaz, Materials Engineering, Purdue University

Key Words: aptasensors, biopatterning, ink-jet printing; pathogen detection

The increasing incidence of infectious outbreaks from contaminated food and water supplies continues to impose a global burden for public health. There is a market demand for on‑site, disposable, easy‑to-use, and cost‑efficient pathogen sensing devices. Despite the rapid growth of biosensing as a research field, and the generation of breakthrough technologies, more than 80% of the biosensors developed at the laboratory scale never will get to meet the market. This work presents a cost‑efficient, reliable, and repeatable aptasensing platform for the whole-cell detection of foodborne pathogens in real food samples. An optimized inkjet printing platform was designed, taking advantage of the carefully controlled bionanopatterning of novel carboxyl‑functionalized aptameric inks on a nitrocellulose substrate. The aptasensors demonstrated a highly efficient detection of whole-cell *E. coli* O157:H7 (10^1 colony forming units (CFU) mL^{-1} in pure culture and 10^2 CFU mL^{-1} in ground beef), with no need for cell lysis. This sensing platform has a controlled sensing response variation within ±1 SD for at least 75% of the data collected even at very low concentrations. To the best of the authors' knowledge, this work reports the lowest limit of detection of a paper‑based whole-cell optical sensor for *E. coli* O157:H7, with enough evidence to prove its high repeatability, as well as specificity at genus, species, strain, and serotype level.