Chenxu Yu, J Biosens Bioelectron 2018, Volume 9
DOI: 10.4172/2155-6210-C1-036

9th World Congress on
BIOSENSORS AND BIOELECTRONICS
August 29-30, 2018 Tokyo, Japan

A multiplex self-referencing detection of extremely low counts of pathogens using Surface Enhanced Raman Scattering (SERS) nanoprobes in a nano-DEP microfluidic biosensor

Chenxu Yu
Iowa State University, USA

Foodborne and/or waterborne pathogens have always been one of the major threats to public health and welfare. In this study, we aimed to develop an integrated spectroscopic biosensor which utilizes Nano-dielectrophoresis microfluidics to quickly and effectively isolate and collect pathogen targets (e.g., bacterial cells, viruses) from field-collected samples (e.g., wash water of contaminated fresh produces, environmental water samples, etc.) and detects, characterizes and differentiates the pathogen targets with a Nano-enabled and self-referencing SERS identification (I.D.) protocol. Two different types of anti-*Escherichia coli* O157:H7 monoclonal antibodies are covalently conjugated to nanoparticles through different Raman enhancer molecules (4-aminothiophenol and 3-amino-1,2,4-triazole-5-thiol) which are strategically selected to chemisorb as a thiolate adlayer on the gold nanoparticle, to provide a strong and unique superimposed spectral signature for the detection of *E. coli* O157:H7. Carbon Nanofiber (CNF) Dielectrophoresis (nanoDEP) microfluidic device is utilized to screen the individual bacteria covered with nanoparticle matrixes from unbounded nanoparticles in mixed solution without multiple washing steps. A self-referencing scheme is implemented in which Surface Enhanced Raman Spectroscopic (SERS) signatures of the targets are observed superimposed with the SERS signals of the Raman tags to report probe-target binding. The assessment through the dual signals (superimposed target and tag Raman signatures) supported a specific recognition of the targets in the presence of non-target bacteria at 10 times higher concentration at 100 CFU/mL in a single step. The self-referencing protocol implemented with a portable Raman spectrometer integrated with a nano-DEP microfluidic lab-on-a-chip allows quick capturing of pathogen cells in food wash water and/or environmental water samples and a single-cell level detection of the target.

Biography

Chenxu Yu has obtained his PhD from University of Wisconsin-Madison in 2003 and had completed his Postdoctoral training from Pennsylvania State University and Purdue University. He has been on the Faculty of Iowa State University since 2007 and is currently serving as an Associate Professor in the Departments of Agricultural and Bio-systems Engineering, Food Science and Human Nutrition and the Interdepartmental Graduate Program of Environmental Sciences. He has published more than 50 papers in peer-reviewed journals and has been serving as an Editorial Board Member for various journals of repute.

chenxuyu@iastate.edu