Tytuł:

Microfluidic Devices and Systems for the Strain-specific Detection of Pathogens

Streszczenie

The outbreaks of bacterial infections have renewed interest in developing rapid, specific, and accurate systems for the identification of pathogens in contaminated food, water supplies, and clinical samples without a need for bacterial cultures. To address this necessity, we have fabricated and employed microfluidic devices for the affinity isolation of pathogens and/or their molecular cargo for the detection of different bacterial and viral species (i.e., E. coli, Salmonella, M. tuberculosis, SARS-CoV-2, HRSV). Microfluidic devices can work as sample preparation units in a high-throughput format, providing the advantage of (i) specificity by means of an affinity agent immobilized on its surface and (ii) preconcentration of the pathogens in a small volume for the identification via molecular methods. These devices can also be an integral part of modular-based microfluidic systems (i.e., integrated systems containing task-specific multiple devices) for the strain-specific identification of pathogens. Such systems can carry out the entire molecular processing pipeline in a single disposable fluidic cartridge and can detect bacteria-specific genes or single nucleotide variations in selected genes to allow for the identification of drug-resistant pathogens (i.e., multi-drug resistant M. tuberculosis). Results collected with microfluidic devices and integrated systems for the detection of different pathogens will be presented.

Biogram

Małgorzata A. Witek received an MSc. and an Engineering degree from the Department of Chemistry and Chemical Technology at the Silesian University of Technology in Gliwice, Poland. She earned her Ph.D. degree in Analytical Chemistry from Michigan State University in 2002 under the tutelage of Prof. Greg M. Swain. The same year, Maggie joined Prof. Steven A. Soper's research group in the Department of Chemistry at Louisiana State University. Her postdoctoral work focused on controlled biological cell transport via electromigration in thermoplastic microfluidic devices and developing the on-chip solid-phase extraction platform for nucleic acid isolation. Over the years, Maggie continued research on applications of polymer-based, lab-on-a-chip devices for biomedical applications, such as separations, high throughput solid-phase nucleic acid purification and molecular testing. In 2011, she joined the Department of Biomedical Engineering at the University of North Carolina in Chapel Hill as an Assistant Research Professor.

Currently she works as an Associate Research Professor in the Department of Chemistry at the University of Kansas, Lawrence. Her research involves microfluidic-based isolation of liquid biopsy markers, including circulating tumor cells, selection of extracellular vesicles and cell-free DNA for stroke and cancer diagnostics.