Chemical & Physical Sciences
UNIVERSITY OF TORONTO
MISSISSAUGA

COLLOQUIUM

TUESDAY, MARCH 12TH, 2013
12:00 P.M. (SHARP) – 1:00 P.M.
IB270

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"Ink-Jet Printing of Sol-Gel Derived Bioinks to Produce Bioactive Paper Sensors for Environmental and Biomedical Analysis"

Bioactive paper-based diagnostic sensors have recently gained attention as a platform for rapid and inexpensive analysis in a field setting. In this presentation, the use of ink-jet deposition of reagents onto paper-based lateral flow devices, and the use of such devices for toxin and pathogen detection will be described. The first example will focus on the use of a reagentless bioactive paper-based solid-phase biosensor for detection of acetylcholinesterase (AChE) inhibitors, including organophosphate pesticides, with detection limits in the low to sub-nanomolar range using a 5 min analysis time. The second example describes a novel lateral flow colorimetric paper sensor for detection of E.coli using the intracellular enzymes, b-glucuronidase (GUS) or b-galactosidase (GAL). The chromogenic substrates, 5-bromo-4-chloro-3-inodyl--D-glucuronide (X-GLUC) or chlorophenol red – Dgalactopyranoside (CRPG), which are printed onto the paper strip, are hydrolyzed by GUS or GAL to form a dark blue indigo or red dye, respectively. The coloured product is captured and preconcentrated on the paper using hydrophobic barriers. The assay protocol involves selective magnetic preconcentration of specific E. coli strains, including H7:O157, followed by lysis of cells and detection of GUS or GAL on paper, and provides detection limits in the range of 25 cfu/mL in 5 min, <1 CFU/mL with ~3 h of culturing, and better than 1 CFU in 100 mL of water after 8 h of culturing. Both the pesticide and pathogen detection strips are shown to be suitable for rapid and quantitative testing of food and beverage samples. Recent results involving scale up of printing using conventional office printers and results from ongoing large-scale validation studies in Kenya, India, Europe and North America will be presented. Methods for improving sensor performance and ease-of-use will be highlighted.