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Contribution ID: **3078** Type: **Oral Competition (Graduate Student) / Compétition orale (Étudiant(e) du 2e ou 3e cycle)**

(G*) Rapid Detection of Bacterial Pathogens in Water and Clinical Specimens Using Laser-Induced Breakdown Spectroscopy

Wednesday, 8 June 2022 11:15 (15 minutes)

Our lab is developing laser-induced breakdown spectroscopy (LIBS) as a method to rapidly diagnose bacterial infections. Rapid diagnosis of bacterial infections would improve clinical response times, reduce the overuse of broad-spectrum antibiotic drugs, and improve patient outcomes. LIBS is a spectrochemical technique that can rapidly identify the elemental composition of a specimen. The specimen is ablated with an intense laser pulse in order to create a micro plasma. Light is collected from the cooling plasma and dispersed by a high-resolution Echelle spectrometer to create a high signal-to-noise time-resolved optical emission spectrum.

The optical emission spectrum from an ablated target which contains bacterial cells is dominated by emission lines from several inorganic elements including calcium, magnesium, phosphorus, and sodium. Currently, we deposit bacterial cells onto nitrocellulose filter media by centrifuging bacterial suspensions through a custom fabricated concentration device to achieve a thin film of bacteria. Using our method of deposition, spectra from five species of bacteria have been acquired: *Staphylococcus epidermidis*, *Escherichia coli*, *Mycobacterium smegmatis*, *Pseudomonas aeruginosa*, and *Enterobacter cloacae*. As well, spectra from the blank filter media, sterile water, and sterile clinical specimens including blood and urine have been collected.

This presentation will detail our efforts to optimize chemometric algorithms, specifically partial least-squares discriminant analysis (PLSDA), to reliably detect the presence of bacterial pathogens in sterile fluids. Reliable and accurate discrimination has been achieved between bacteria and sterile water, and the sensitivity and specificity for this discrimination will be discussed. This presentation will also detail our efforts to characterize sterile clinical specimens such as blood and urine using LIBS and our efforts to detect bacteria in these sterile specimens. PLSDA is used to classify between sterile clinical specimens and those containing bacteria. The accuracy of bacterial detection in these sterile bodily fluids will be discussed.

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