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87 - Concentration of Cells and Elimination of Extraneous Background Signals in Laser-Induced Breakdown Spectroscopy to Identify, Differentiate and Detect Bacteria

Tuesday 4 June 2019 16:47 (2 minutes)

Our lab has been investigating the use of laser-induced breakdown spectroscopy (LIBS) for the rapid identification of bacteria in clinical specimens. The ability to rapidly identify harmful pathogens in such specimens is crucial for initiating appropriate treatment of infectious diseases that can kill within hours of the onset of symptoms. Current laboratory techniques can take as long as 24-72 hours for a positive identification. Our research program is attempting to reduce that time to minutes. Sample preparation methods utilized in our procedure include common materials and equipment that could be easily implemented in clinical settings.
The current protocol involves the collection of bacteria using pathology swabs, centrifuging the suspension through a custom-fabricated cone device and concentrating the bacterial cells in a liquid suspension onto a small circular deposition area 1 mm in diameter upon a nitrocellulose filter medium. A pulse of high-intensity laser light focused onto the circular deposition allows a sensitive measurement of the elemental composition of the cells, leading to the detection and identification of the bacteria. By reducing the cell concentration in various suspensions, the limit of detection may be calculated.
Laser ablation of the filter medium and other elemental contaminants yields a non-zero background signal when a control experiment is performed in the absence of bacterial cells. This poster will present our efforts to identify exactly what the sources of this non-bacterial signal are, test other types of filter media which may contribute to reduced background signal and to add preparation steps to the protocol, which might reduce or eliminate this undesired background signal. In addition, the investigation of how chemometric algorithms such as Partial Least Squares Discriminant Analysis and Discriminant Function Analysis can be used to differentiate between the LIBS emission spectra obtained from 4 different bacterial species will be discussed.

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