

Rapid Identification of Bacterial Pathogens Using Laser-Induced Breakdown Spectroscopy

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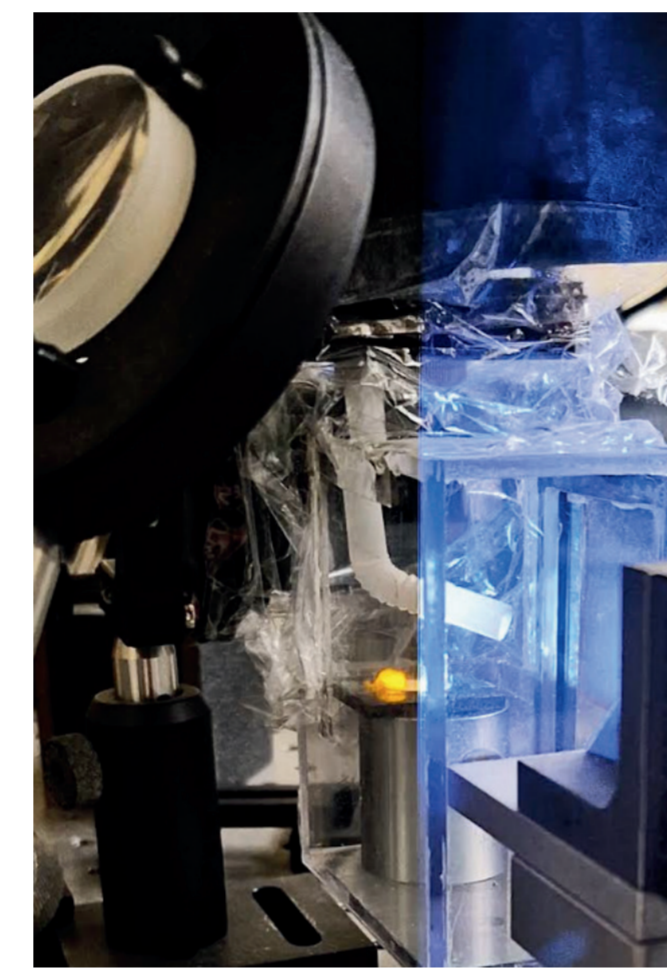


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Motivation

Rapid identification of bacterial pathogens remains a major challenge in clinical diagnostics. Current diagnostic methods can be costly and time-consuming, leading to delayed treatment while infections progress and even to misdiagnoses. **Laser-induced breakdown spectroscopy (LIBS)** has emerged as an active area of research for rapid bacterial identification by analyzing atomic emission spectra obtained from laser-induced plasmas, and has potential for future medical applications.

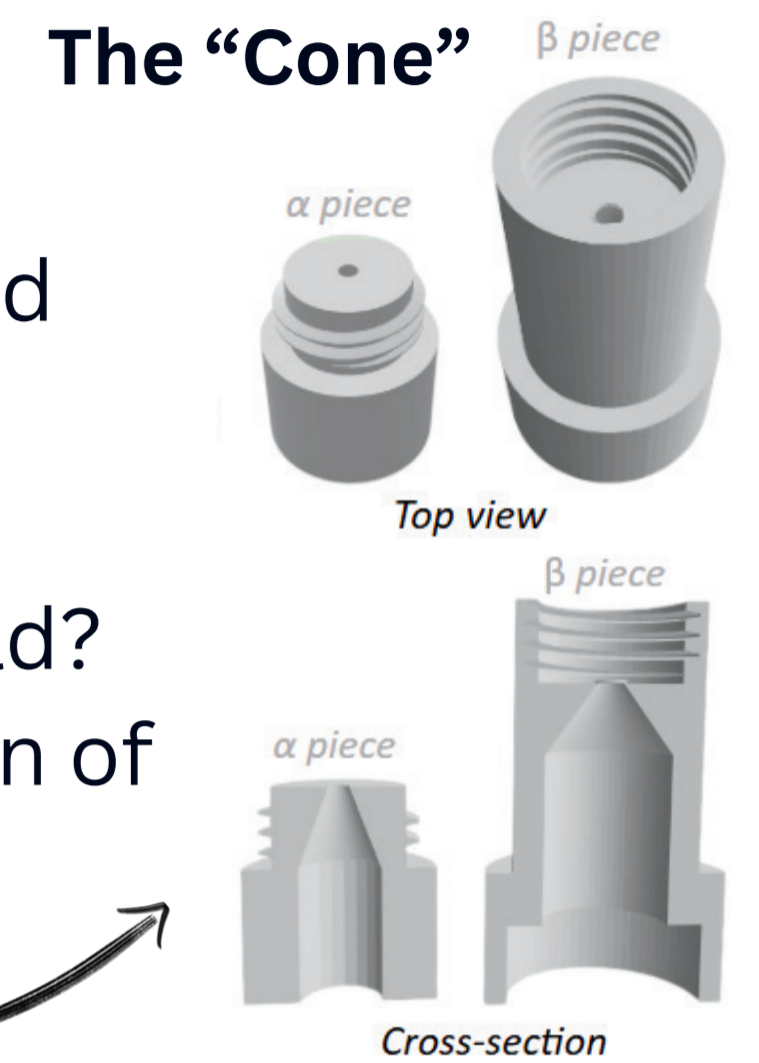
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Limitations:

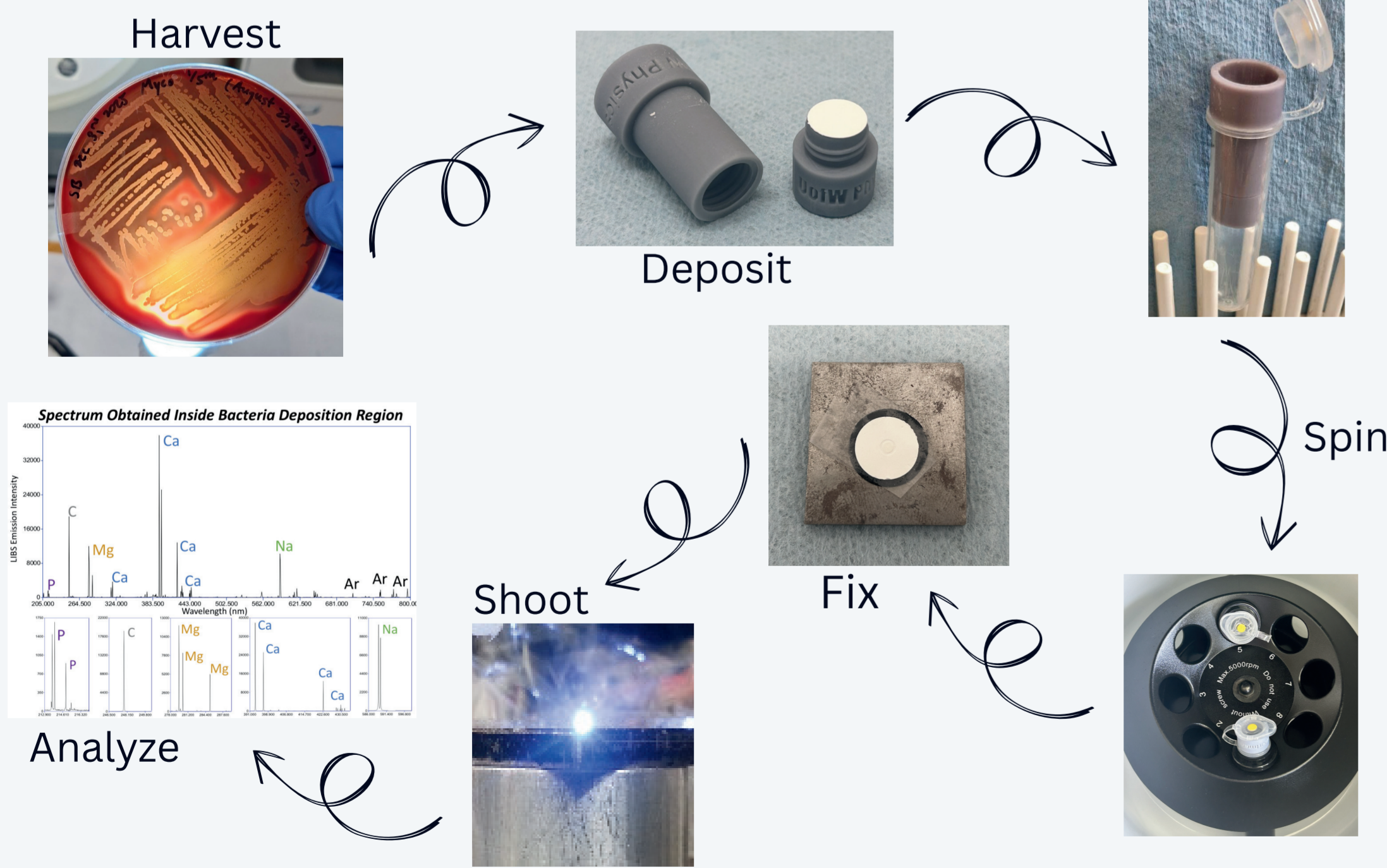
- Can bacterial concentrations *in vivo* be accurately simulated across infection stages?
- How feasible are clinical samples to obtain for our studies?
- Is there a standard approach to machine learning in this field?
- How does the lack of available tools necessitate the creation of custom ones?

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Methodology

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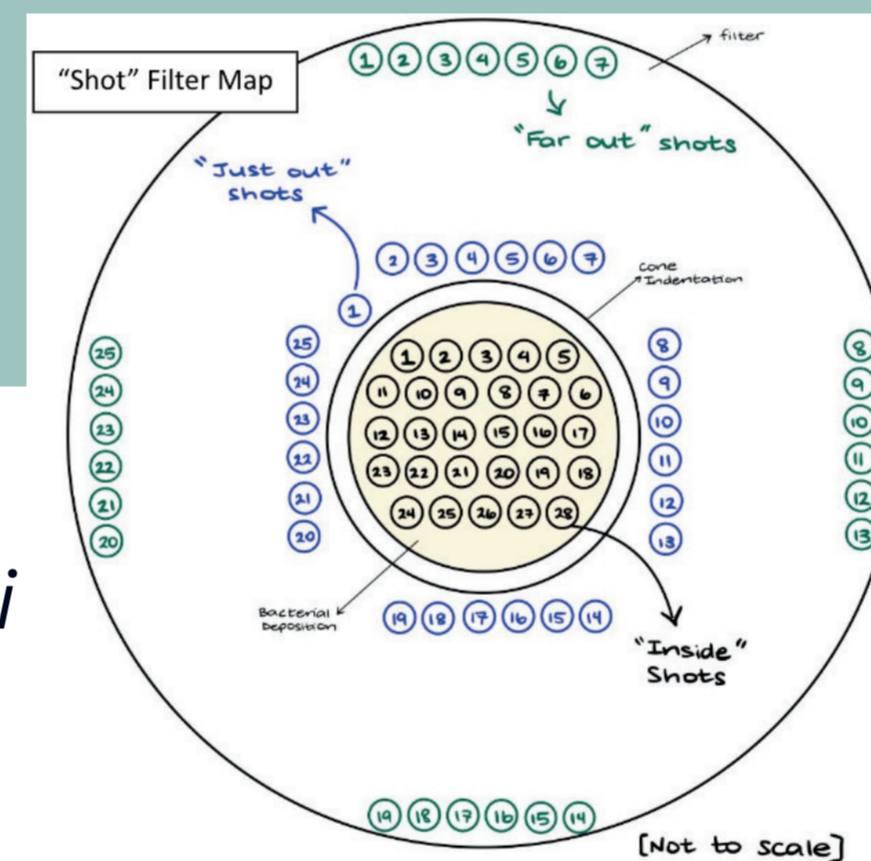
Bacteria:

- *Escherichia coli*
- *Streptococcus salivarius*
- *Staphylococcus epidermidis*
- *Mycobacterium smegmatis*
- *Enterobacter faecium*
- *Pseudomonas aeruginosa*



Test Fluids:

- Blood
- Urine
- Artificial Cerebrospinal Fluid (aCSF)



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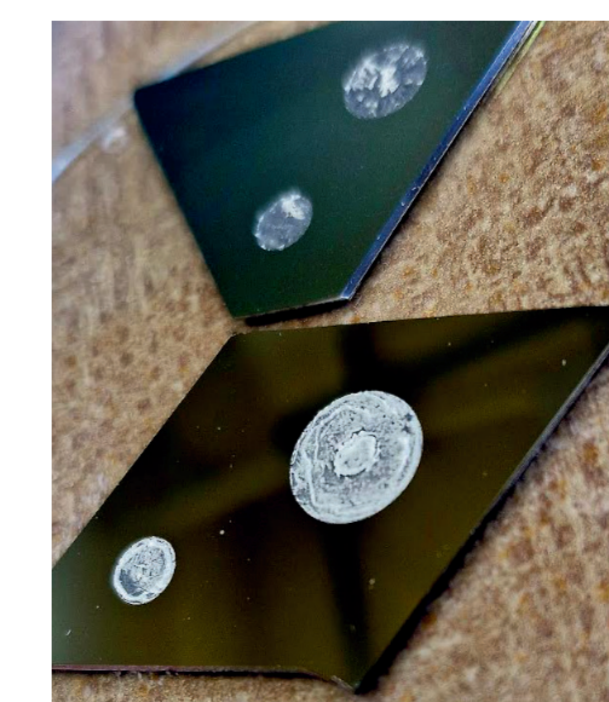
Future Directions

- Increase the number and variety of spectra acquired
- Enhance spectral emissions from the plasma
- Investigate suitable substrates
- Dismembration for uniform deposition
- Meningitis in aCSF
- Viruses and other pathogens

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Nitrocellulose Filter



Silicon Wafers

