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Investigation of Sporicidal Effect of Gas Discharge Plasma

SHAWN TSENG, WEI-JEN LIN, NINA ABRAMZON, California State Polytechnic University, Pomona — Bacteria spores are the most resistant form of life and have been a major threat to public health and food safety. In this study, helium-based plasmas were used to treat spores of various bacteria including *Bacillus* and *Clostridium*. Gas discharge plasma was produced by using an Atomflo™ reactor (Surfx Technologies). The spore species tested include *B. subtilis*, *B. stearothermophilus*, *C. sporogenes*, *C. perfringens*, and *C. difficile*. Also, the bactericidal effects of plasmas are tested against vegetative cells of *B. subtilis*, the gram positive rods, and the gram negative rods, *Escherichia coli*. The D-values for spores range from 2 to 10 minutes, in comparison with the D-values of vegetative cells, ranged from 20 to 50 seconds. Our results show the effectiveness of using plasmas to sterilize vegetative bacterial cells as well as bacterial spores of various types. Optical emission spectroscopy was used to study plasma composition which was then correlated with the effectiveness of killing. The sporicidal mechanisms of various plasma species will be characterized morphologically and molecularly in future studies.

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