NON-THERMAL PLASMA STERILIZATION OF WOUNDS ON NON-UNIFORM SURFACES AND LIVING TISSUES

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The high probability of contracting an infection from an untreated wound demonstrates the need for alternative sources of wound healing and sterilization. Recent studies have demonstrated the ability of non thermal floating electrode dielectric barrier discharge (FE-DBD) to fully sterilize uniform surfaces containing various concentrations of bacteria. However, non-uniform surfaces have shown significantly less sterilization and require further experimentation.

Depth of plasma discharge penetration through a non-uniform surface was studied by using custom agar molds and sections of pig skin. Varies step size molds were manufactured, maintaining constant width but altering depth. These molds were then inoculated, treated with FE-DBD, and re-suspended in order to determine the statistical reduction of applied bacteria. Pig skin was used to simulate application of plasma discharge on an infected wound. Through confocal microscopy and bacterial staining, depth of bacterial penetration through the skin was calculated. Treated and untreated samples of pig skin were compared by measuring average intensity of fluorescence through confocal slicing.

Slight variations in non-uniformity greatly reduce the ability to sterilize the surface. Creating 0.33mm non-uniform depths resulted in only a three log reduction of bacteria. Increasing depths only yielded less sterilization. Similar results were unobtainable on skin due to its natural complexity. To determine the reasoning, inoculate skin was stained to discover depth of bacterial penetration. Through confocal microscopy, *S. Aureus* produced its highest average florescent intensity at 750 to 1000 microns, revealing its approximate location beneath the surface.

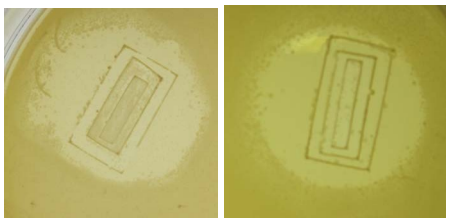

Fig. 1. Comparison of non-uniform plasma (left) with uniform plasma (right) sterilization efficiency.

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