

Cold air plasma to decontaminate inanimate surfaces of the hospital environment

T. Claro*, O. Cahill, N. O'Connor, S. Daniels, H. Humphreys (Dublin, IE)

Objectives: The hospital environment harbours bacteria which may contribute to the development of hospital-acquired infections. Opportunistic micro-organisms such as multi-resistant bacteria can spread around the patient's inanimate environment. Current bio-decontamination approaches in hospitals have significant limitations due to the toxic nature of the gases and the length of time required for aeration. In this study, we assessed the use of cold plasma for bio-decontamination as an efficient alternative to traditional methods.

Methods: Methicillin-resistant *Staphylococcus aureus* (MRSA) and extended spectrum beta-lactamase (ESBL) positive *Escherichia coli* overnight cultures of approximately 10^6 to 10^8 colony forming units were applied to different surfaces, replicating the surfaces in the hospital environment. Inoculated surfaces, marmoleum, mattress, powder-coated mild steel, stainless steel and polypropylene were treated with an air plasma plume for 30, 60 and 90 s, operating at approximately 25 W and 13 L/min flow rate. The plume temperature did not exceed 45 °C. Both test and control (non-treated) surfaces were swabbed using flocked eSwabs and cultured for enumeration as appropriate using Columbia blood agar plates (MRSA) and ESBL selective agar plates (ESBL-E.coli).

Results: The effect of air plasma on MRSA inoculated onto different surfaces is summarized in Figure 1. Direct plasma exposure over 90 s reduced the MRSA load by at least log 3 reductions for all the surfaces tested. For ESBL E. coli, air plasma achieved reductions of log 2 to log 4 numbers depending on the surface type.

Conclusions: The present study demonstrates the efficient microbicidal activity of an air plasma plume on MRSA and ESBL E. coli artificially contaminated surfaces over a short period of time. This research highlights the potential use of air plasma for routine bio-decontamination of different surfaces in the clinical environment.

