

INTRODUCTION

Healthcare-associated infections

- Affect 5-10 % of patients admitted to hospital.
- The healthcare environment can be a source of infection.
- Traditional & novel approaches to decontaminate hospital surfaces have significant limitations.

Solution Air plasma

Chemically reactive species with antimicrobial properties.

- Effective against biofilms;
- Low temperature operation;
- Air is primary gas supply;
- Practical for use in hospitals.

METHODS

Strains: *Acinetobacter baumannii*, extended spectrum β -lactamase (ESBL) producing *Escherichia coli*, methicillin-resistant *Staphylococcus aureus* (MRSA) and vancomycin-resistant enterococcus (VRE) cultures and *Clostridium difficile* spores.

Inoculum: log 7 to log 9 colony forming units (CFU) per mL.

Surfaces: 25cm² sections of mattress and stainless steel, replicating surfaces in the hospital environment.

Treatment: Inoculated surfaces were treated with an air plasma multi-jet array up to 45s. Surfaces were swabbed using flocked swabs and cultured for bacterial enumeration.

RESULTS

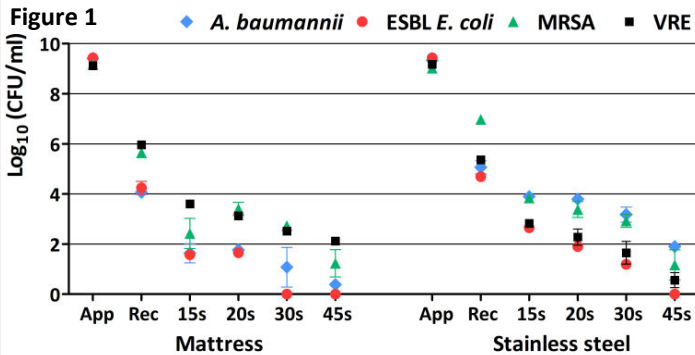


Table 1

Surface	Mattress		Stainless steel	
	45s log reduction	P value	45s log reduction	P value
<i>A. baumannii</i>	3.68	P<0.05	3.16	P<0.001
ESBL <i>E. coli</i>	4.24	P<0.001	4.69	P<0.001
MRSA	4.40	P<0.05	5.80	P<0.01
VRE	3.84	P<0.001	4.80	P<0.001

The microbicidal effect of the air plasma multi-jet varied depending on the type of surface and microorganism (Figure 1 & 2). On the mattress, a 45s exposure time reduced the bacterial load of *A. baumannii*, ESBL- *E. coli*, MRSA and by log 3.68 to log 4.40 (Table 1). On stainless steel, 45s reduced the bacterial load of *A. baumannii* by log 3.16, ESBL-*E. coli* by log 4.69, MRSA by log 5.80, and VRE by log 4.80.

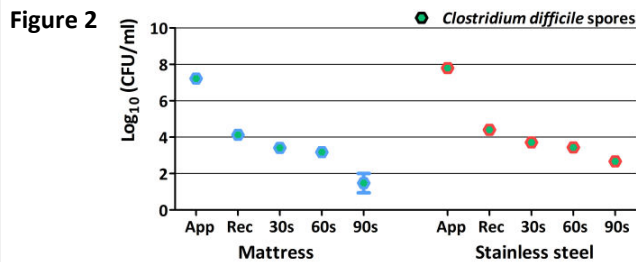


Table 2

<i>Clostridium difficile</i> spores			
Mattress		Stainless steel	
90s log reduction	P value	90s log reduction	P value
2.66	P<0.05	1.73	P<0.05

C. difficile spores were more resistant (Figure 2); there was a reduction in the bacterial load of log 2.66 on mattress and log 1.73 on stainless steel after 90s (Table 2).

CONCLUSIONS

A multi-jet air plasma prototype significantly reduced the bacterial load of all of the five strains tested on mattress and stainless steel surfaces. Further work will follow to improve the efficacy of the multi-jet plasma device against *Clostridium difficile* spores.

ACKNOWLEDGEMENTS