Response to letter of Singh K 'Role of silver nitrate in the efficacy of hydrogen peroxide aerial decontamination systems' regarding S Ali et al. 'Efficacy of two hydrogen peroxide vapour aerial decontamination systems for enhanced disinfection of methicillin-resistant *Staphylococcus aureus*, *Klebsiella pneumoniae* and *Clostridium difficile* in single isolation rooms.'

Sir,
In response to the letter from Dr Singh commenting on our paper.[1,2]

The objective of our study was to evaluate the reductions in environmental contamination during in-use operation of two commercially-available Hydrogen Peroxide whole-room disinfection systems.[2] Both manufacturers agreed test parameters prior to the trial to ensure methodology followed manufacturer instructions. Our findings suggested similar efficacy of the two systems against both surface contamination and biological indicators of common pathogens. Inocula used on the indicators far exceeded the likely levels seen in the environment.

Additional studies were performed as part of the original work using the same methodology with four strains each of MRSA, *Klebsiella pneumoniae*, *C difficile* spores and *Acinetobacter baumannii*. Three HPV decontamination cycles were evaluated for each system. Of 305/320 samples, >4-$\log_{10}$ reduction was achieved.

Aerial concentrations of hydrogen peroxide and relative humidity were monitored continuously during a further 6 cycles of both systems using a sensor (C-16 Portasens II Gas Detector; Analytical Technology, Inc.). In addition, horizontal surfaces in the near-patient vicinity were swabbed and analysed to detect fallout of silver and nitrate at the end of HPV decontamination cycles (n=3). Surfaces were swabbed and analysed for silver by titration (Silver Test Kit, DTK Water, UK) and nitrate using Quantofix semi- quantitative test strips (Macherey-Nagel, Düren, Germany).

For the Hygiene Solutions (Deprox) system, peak aerial values of 29-46 ppm hydrogen peroxide were achieved with similar bacteriological efficacy as other cycles. The mean level at the end of the cycles was 3.3ppm for 41.8% (30.8-58.1%) mean relative humidity at start of cycles. Silver and nitrate were detected on surfaces at 1.5-2.5mg/m^2 following cycles with the Deprox system.

For the Bioquell Q10 system with the R10 aeration unit, the peak aerial levels of hydrogen peroxide were 450-640ppm. The mean level at the end of the cycles was 0.0ppm with starting mean relative humidity 42.5% (34.5-49.7%). No silver or nitrate was detected on surfaces following cycles with the Bioquell Q10 system.

The aqueous concentration of hydrogen peroxide in a Hygiene Solutions cartridge (Deprox) tested on one occasion at the point of insertion into the machine was 5%. Nitrate was detected in the aqueous solution at 10-25mg/L. The aqueous hydrogen peroxide concentration in the Bioquell Q10 cartridge (Bioquell HPV-AQ) was 35% and no silver or nitrate was detected.

Dr Singh suggests *C. difficile* spores (but not the other organisms) persisted underneath the bed and on the window frame after decontamination using the Deprox system. The persistence of spores may have been minimised during the Bioquell Q10 cycles by the

inclusion of an oscillating fan to facilitate aerial distribution and aid breakdown of hydrogen peroxide vapour

As Dr Singh suggests, settling of active silver onto biological indicator coupons during a cycle of aerial HPV decontamination may have contributed to the bactericidal/sporicidal activity of the Deprox system. However further studies would be required to elucidate its role.

Conflict of interest statement
None declared

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References

1. Singh K. Role of silver nitrate in the efficacy of hydrogen peroxide aerial decontamination systems. *J Hosp Infect* 2017.

2. Ali S, Muzslay M, Bruce M, Jeanes A, Moore G, Wilson APR. Efficacy of two hydrogen peroxide vapour aerial decontamination systems for enhanced disinfection of meticillin-resistant *Staphylococcus aureus*, *Klebsiella pneumoniae* and *Clostridium difficile* in single isolation rooms. *J Hosp Infect* 2016; 93: 70-77

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