

Ultra-violet In-room Air Disinfection and Recirculation Units Reduce Airborne Bioburden During Lower Limb Total Joint Arthroplasty

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- Airborne bacteria are a major cause of site contamination in TJA
- Crystalline ultraviolet C (C-UVC) units have a biocidal effect
- The purpose of this study was to evaluate the impact of a C-UVC unit on 1) airborne particles; and 2) airborne bacteria

Methods

- 32 primary TKAs/THAs in positive-pressure OR: 16 cases with the C-UVC, and 16 cases without C-UVC
- Particle counter measured total and viable airborne particles (TPC and VPC)
- Impact air samplers with agar plates measured colony forming units (CFU/m³) of airborne bacteria
- Statistical analyses: independent t-tests and multiple linear regression

Results

Figure 1. Mean total particle count without C-UVC (left) and with C-UVC (right) (error bars are $\pm 2x$ standard error)

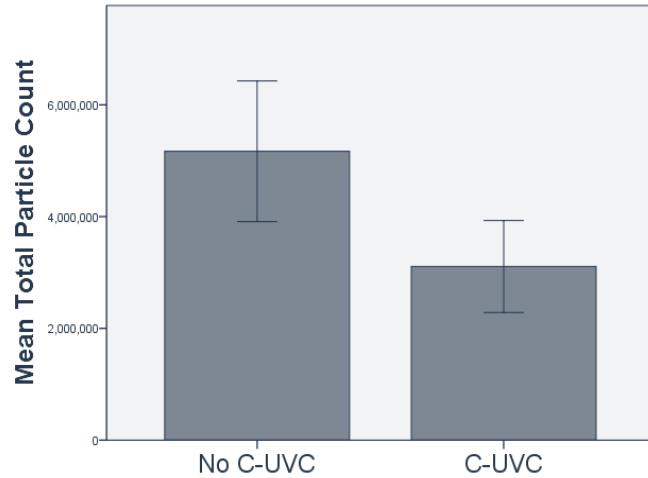


Figure 2. Mean viable particle count without C-UVC (left) and with C-UVC (right) (error bars are $\pm 2x$ standard error)

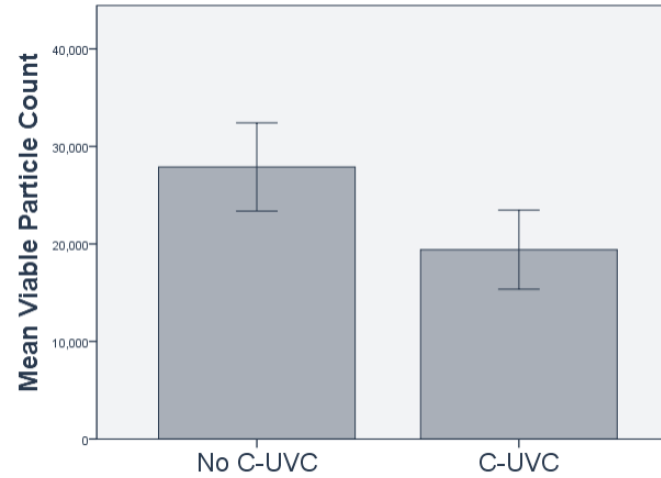


Figure 3. Mean colony forming units without C-UVC (left) and with C-UVC (right) (error bars are $\pm 2x$ standard error)

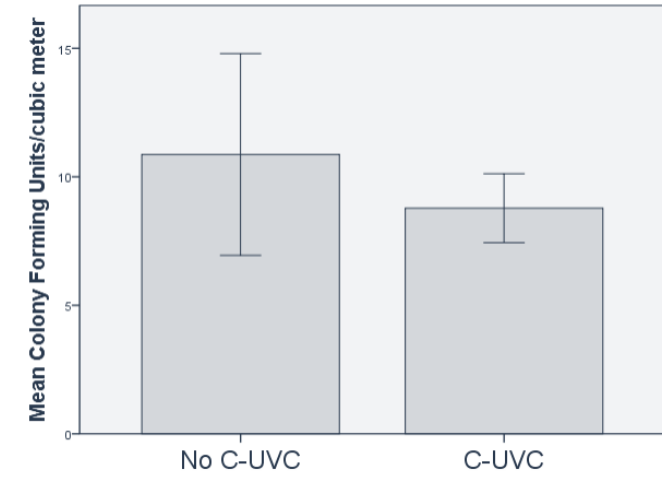


Table 1. Multivariate linear regression for TPC, VPC, and CFU with C-UVC compared to without C-UVC

	β (standardized coefficient)	B (unstandardized coefficient)	95% Confidence interval		p-value
			Lower	Upper	
TPC	-0.42	-1.9×10^6	-3.6×10^6	-2.9×10^6	0.022
VPC	-0.46	-8,563	-15,221	-1,904	0.014
CFU/m ³	-0.22	-2.6	-7.0	1.9	0.244

Adjusted for number of OR staff and door openings

C-UVC associated with reduction in:

- total particles ($p < 0.05$)
- viable particles ($p < 0.05$)
- colony forming units ($p > 0.05$)

Conclusion

- C-UVC reduced airborne bioburden during TJA
- Total and viable particles significantly reduced with C-UVC
- Reduction in cultured airborne bacteria
- Further studies to investigate effect on surgical site infection rate in TJA

