Analysis of the Clonal Recovery Pattern of *Enterococcus faecium* to Evaluate the Efficacy of Pulsed Xenon Ultraviolet Light (PX-UV) in Bioburden Reduction

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Introduction

- *Enterococcus faecium (E. faecium)* is a common hospital- associated infection (HAI) that can lead to increased costs, morbidity, and mortality.
- Pulsed Xenon Ultraviolet light (PX-UV) has been shown to reduce bacterial bioburden levels on surfaces.
- This study aims to assess the effect of the addition of PX-UV to terminal cleaning on the clonal recovery of *E. faecium* sequence types (STs) using Whole Genome Sequencing (WGS) on patient isolates.

Methods

- During 2017 to 2020 a prospective, randomized, double-blinded, sham-controlled, interventional, crossover trial in 2 separate Detroit hospitals (H1 and H2) compared HAI counts after the addition of either PX-UV or a non-UV sham device to terminal cleaning methods.
- The trial consisted of a total of 16 units randomized to have either the treatment of PX-UV (Group Q) or the sham control device with no UV (Group W) for 12 months.
- A washout period (Group R) of 6 months followed and the trial concluded with a 12-month crossover of treatments.
- A total of 60 *E. faecium* samples were collected, then WGS was performed by the Illumina Nextseq 550 instrument. *De novo* assembly was preformed using the SPAdes program.
- Whole Genome Multilocus Sequence Type (wgMLST) analysis was performed by BioNumerics (v7.6) to construct a minimum spanning tree (MST).

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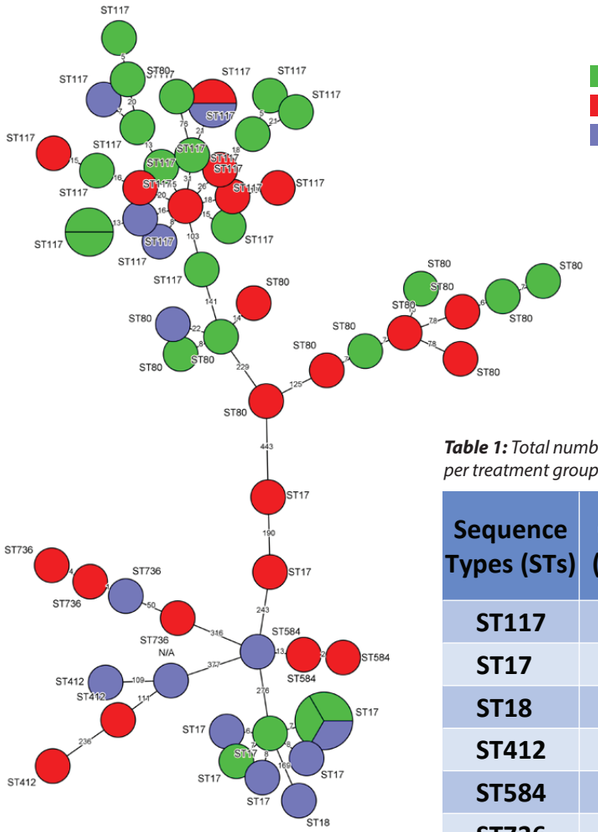

Figure 1: *Minimum spanning tree (MST) for E. faecium sequence types (STs)*

Table 1: *Total number of each sequence type (ST) following PubMLST scheme per treatment group*

Sequence Types (STs)	Group Q (Real UV)	Group R (Washout, No UV)	Group W (Sham UV)	Total
ST117	4	7	13	24
ST17	4	2	4	10
ST18	1	0	0	1
ST412	1	2	0	3
ST584	1	2	0	3
ST736	1	3	0	4
ST80	1	6	7	14
N/A	1	0	0	1
Total	14	22	24	60

Results

- A total of 7 STs were obtained across the 2 hospitals (H1 and H2). ST117, ST17, and ST80 all had more than 10 total recovered isolates, ST117 being the most frequent with 24 isolates.
- Less than 3 isolates were recovered for all other STs.
- For all STs, Group Q (PX-UV) had 14, Group R (washout period) had 22, and Group W (non-UV sham) had 24.
- ST18 was only found in Group Q. ST412, ST584, and ST736 were not found in Group W.
- The data shows that the intervention PX-UV group had a reduction of clonal recovery by 10 STs as compared to the sham UV group.

Conclusions

- The overall reductions in the number of isolates in the real UV units was driven by reductions in ST117, a predominant strain in a hospital environment reported previously in Detroit, and ST80.
- There were negligible differences in recovery of other STs between the groups.
- The reduction in clonal recovery of *E. faecium* isolates in Group Q as compared to Group R may be due to PX-UV and it can serve as an adjunct control measure to prevent the spread of infections.

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