Environmental Contamination of Rooms of Patients Harboring Multidrug-Resistant Organisms

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Background

- Healthcare environment multidrug-resistant organism (MDRO) contamination is an important source of healthcare-associated MDRO transmission.
- We aimed to determine the concordance of MDRO isolate recovery from patient swabs and hospital room environmental surfaces to evaluate the potential benefit of patient decolonization.

Methods

- MDRO+ patients were identified by positive clinical microbiology results with target MDROs at any cultured site (Figure 1).
- Control patients without a known MDRO infection were sampled from the same ward at the time of sampling MDRO+ patients.
- After rectal and inguinal swabs were collected, high touch room and toileting surface composites were sampled (350mm^2).
- Patient swabs were plated on MDRO-selective media.
- Sponge sticks were processed in a stomacher, and the resulting homogenate was centrifuged.
- Resuspended pellets were plated on nonselective media to quantify microbial burden and screened with MDRO-selective media.
- Isolates were identified by MALDI-TOF.
- AST was confirmed by Vitek 2

Multidrug-Resistant Organism contamination of patient room environmental surfaces is an important reservoir for ongoing transmission. Concordance of clinical, patient and environmental isolates support the premise that effective patient decolonization strategies could reduce healthcare environment contamination.

Figure 1: Environmental Sample Processing Scheme

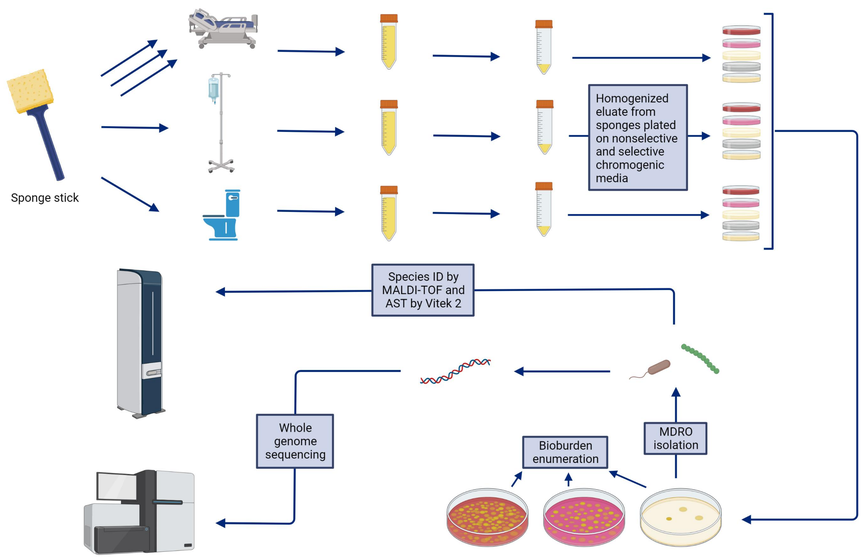

Table 1: MDROs Isolated from Patient and Composite Swabs

Patient	Clinical MDRO detected	Patient Swab[1] P1	P2	P3	Environmental Composite Qualitative Results[2] C1	C2	C3	Environmental Composite MDRO Bioburden
1	**ESCRE**	ND	ND	ND	NG	NG	NG	*n/a*
2	**CRAB**	**CRAB** VRE CRPA ESBL	**CRAB** VRE	**CRAB** VRE	**CRAB** (225 cfu/mL) VRE (30 cfu/mL)	**CRAB** (1 cfu/mL)	NG	**CRAB** (83 cfu//350mm^2) VRE (111 cfu//350mm^2)
3	**CRPA**	NG	**CRPA**	ND	NG	NG	NG	*n/a*
4	**ESCRE**	**ESCRE**	**ESCRE**	ND	NG	NG	**ESCRE** (1 cfu/mL)	**ESCRE** (1 cfu//350mm^2)
5	**VRE**	**VRE**	NG	**VRE**	**VRE** (2 cfu/mL)	**VRE** (25 cfu/mL)	NG	**VRE** (106.8 cfu//350mm^2)
6	**CRE**	**CRE** VRE	**CRE** ESBL	ND	NG	NG	NG	*n/a*
7	**ESCRE**	**ESCRE** CRE VRE	**ESCRE** CRE	ND	**ESCRE** (10 cfu/mL)	NG	NG	**ESCRE** (42 CFU/350mm^2)
8	**VRE**	**VRE**	**VRE**	ND	**VRE** (1 cfu/mL)	NG	NG	**VRE** (1 CFU/350mm^2)
10	**VRE**	ND	**VRE**	ND	NG	NG	NG	*n/a*
12	**ESCRE**	**ESCRE**	VRE	ND	NG	NG	NG	*n/a*
14	**ESCRE**	**ESCRE**	NG	ND	NG	NG	NG	*n/a*
16	**ESCRE**	ND	ND	ND	NG	NG	NG	*n/a*

Patient		Patient Swab[1] P1	P2	P3	Environmental Composite Qualitative Results[2] C1	C2	C3	Environmental Composite MDRO Bioburden
9	Control	NG	VRE	ND	NG	NG	NG	*n/a*
11	Control	NG	NG	ND	NG	NG	NG	*n/a*
13	Control	ESCRE	NG	ND	NG	NG	NG	*n/a*
15	Control	ESCRE CRPA	NG	ND	ESCRE (1 cfu/mL)	NG	NG	ESCRE (1 CFU/350mm^2)
17	Control	NG	NG	ND	NG	ESCRE VRE	NG	ESCRE (1 CFU/350mm^2) VRE (CFU/350mm^2)

Abbreviation: CRAB: carbapenem-resistant *Acinetobacter baumannii*; CRPA: carbapenem-resistant *Pseudomonas aeruginosa*; ESCRE: extended spectrum cephalosporin-resistant *Enterobacterales*; VRE: vancomycin resistant *Enterococcus*; ND: not done, NG: no growth, N/A: not applicable

[1]Patient Swab P1: peri-rectal, P2: wound or tracheostomy, P3: inguinal

[2]Environmental Swab C1: TV remote, telephone, call button and bed rails; Composite 2 room door handle, IV pole and overbed table; Composite 3: toileting surfaces

Results

- Twelve patients were identified with target MDRO clinical cultures. Among these, 10/12 (83%) had a concordant MDRO recovered from patient swabs.
- Concordant MDROs were isolated in surface composites of 5/12 (42%) patients.
- Among five sampled controls, 60% were MDRO colonized, 20% had concordant surface results.
- Further NGS analysis is ongoing.