the temperature, humidity and pressure minute by minute. **Conclusion:** OR traffic increases the particle count particularly the small size. Other physical aspects of the OR environment were tightly controlled. The ability to automatically monitor OR parameters could be extremely helpful for assuring patient safety as well as reviewing OR factors in SSI cases.

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Presentation Type:
Poster Presentation - Poster Presentation
Subject Category: Environmental Cleaning

Filtered handheld far-ultraviolet disinfection device in reducing environmental pathogens from high-touch clinical surfaces

Layale Yaghi, The University of Texas MD Anderson Cancer Center; Rita Wilson-Dib, MD Anderson Cancer Center; Sherry Cantu, MD Anderson Cancer Center; Piyali Chatterjee, Central Texas Veterans Health Care System; Chetan Jinadatha, Central Texas Veterans Health Care System; Roy Chemaly, The University of Texas MD Anderson Cancer Center and Amy Spallone, The University of Texas MD Anderson Cancer Center

Background: Healthcare-acquired infections (HAIs) continue to be a major challenge. In fact, an increased risk of HAIs has been linked to high-touch surfaces contaminated with multidrug-resistant organisms (MDROs), and enhanced environmental disinfection is linked to reduced HAI rates. Recently, more focus has been placed on emerging disinfection technologies, such as UV light-producing portable device that emits light at a wavelength of 222 nm, which has previously demonstrated germicidal capabilities at short contact times. In this study, we aim i) to evaluate the efficacy of a filtered far-UV-C handheld device (FFUHH) to reduce bacterial loads on high-touch surfaces in clinical workrooms in a cancer center, and ii) to isolate, identify and establish a genetic relationship between these environmental clinically significant pathogens and the ones recovered from patients. **Methods:** Samples were collected weekly on a rotating schedule over a 24-week period from five high-touch items (dictation device, mouse, armchair, desk, and keyboard) in multiple clinical work rooms on hematologic malignancy and stem cell transplant units. Contact plates for colony count and swabs were collected pre- and post-intervention with the FFUHH on standardized adjacent areas respectively for each surface. The swabs were enriched and cultured on selective media to isolate clinically significant pathogens. Whole genome sequencing (WGS) was then performed on environmental pathogens validated by MALDI-TOF as well as clinical samples collected from patients in the same unit around the time of environmental sample collection. **Results:** A total of 440 plates, 220 pre- and 220 post-interventions, were collected and analyzed. The highest mean colony count pre-treatment was detected from the armchairs and the lowest for the keyboards. The mean reduction of colony forming units (CFUs) ranged between 53% for the keyboard and 83% for the mouse. The reduction was statistically significant across all surfaces with P values < 0.05, except for the keyboard (Figure 1). We isolated many pathogens of the human microbiota identified by MALDI-TOF such as Micrococcus luteus, S. capitis as well as methicillin-resistant S. epidermidis, S. haemolyticus and S. hominis. We also identified several Candida parapsilosis, Pseudomonas stutzeri, one Listeria grayi and one Acinetobacter baumanni. Finally, WSG allowed us to further characterize an environmental multi-drug resistant S. epidermidis ST5 strain associated with patient bacteremia, and ST16 strains detected on surfaces both pre- and post-FFUHH treatment. **Conclusion:** The FFUHH effectively reduced the microbial burden on high-touch surfaces in clinical workrooms on hematologic malignancy and stem cell units.

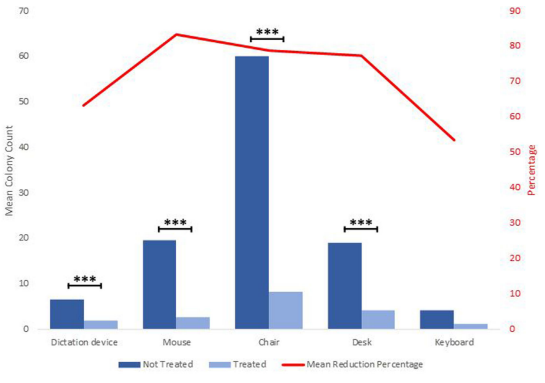

Figure 1: Efficacy of the UV treatment. Columns indicate mean CFUs before and after treatment with the FFUV handheld device for each tested surface. Mean reduction percentages were calculated by comparing not treated and treated values for each surface respectively. Statistical analysis was performed, and P values calculated using Wilcoxon matched pairs signed rank test. (***) indicate statistically significant results with a P value <0.000.

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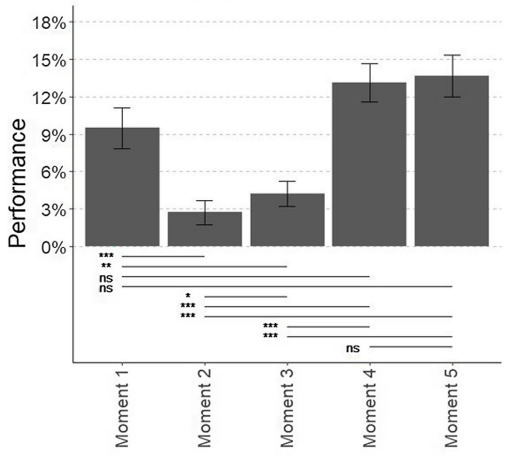
Environmental Fungal Contamination Characterization of Three Inpatient Units Utilizing Optimized Detection Methods

Bobby Warren, Duke Center for Antimicrobial Stewardship and Infection Prevention; Guerbine Fils-aime, Duke University Hospital; Amanda Graves, Duke Center for Antimicrobial Stewardship and Infection Prevention; Aaron Barrett, Duke Center for Antimicrobial Stewardship and Infection Prevention; Matthew Steigel, Duke University Medical Center; Becky Smith, Duke University Medical Center; Ilan Schwartz, Duke Center for Antimicrobial Stewardship and Infection Prevention and Deverick Anderson, Duke Center for Antimicrobial Stewardship and Infection Prevention

Background: Environmental sampling and detection methods for fungi in healthcare settings are not well-established. We previously refined methods for fungal sampling and detection in a controlled laboratory environment and aimed to validate them in a real-world healthcare setting. **Methods:** We performed a microbiological analysis of air and surfaces in three inpatient units at a tertiary care center. Surface samples were obtained with foam sponges from 3 locations in patient rooms (Patient bedrails, bathroom floor, HVAC export) and 5 locations in units (HVAC exports 3x, clean linen storage, soiled linen storage). Air samples were taken with an active air sampler directly below HVAC exports. Sponges were processed using the stomacher technique. Samples underwent DNA extraction followed by qPCR with FungiQuant primers targeting the 18S rRNA gene. Amplicons from positive samples were sequenced (NextSeq 1000, 300bp PE) and SmartGene databases were used to interpret sequence data. For comparison to culture methods, samples were also plated onto Sabouraud and HardyCHROM Candida + auris medias. Fungal growth underwent DNA extraction, 18S PCR and Sanger sequencing for genus and species identification. **Results:** A total of 85 samples were obtained, from 15 patient rooms and three units resulting in 61 surface and 24 air samples. Patients in study rooms had a median age of 53, 9 (60%) were male, and no patients had an invasive fungal infection during their hospital encounter. 44 (53%) and 39 (46%) samples were positive for fungi via qPCR and culture, respectively. Of the 44 positive qPCR samples, microbiome analyses identified at least one fungi to the species, genus and family levels in 43 (98%), 28 (64%), 18 (41%) samples, respectively (Table 1). 114 total isolates were identified of which the most common were Mallassezia restricta (30 [26%]), Malassezia globose (29 [25%]), and Pennicillium paradoxum (4 [4%]). 39 genera were identified of which the most common were Mucor (19 [49%]) and Candida (8 [21%]). Of the 39 culture positive samples, 90 total isolates were recovered. The most common species were Paradendryphiella arenariae (19 [21%]), Aspergillus niger (12 [13%]) and Penicillium commune (12 [13%]). **Conclusion:** These results demonstrate the presence of diverse fungal

	qPCR Positive N(%)	Culture Positive
Overall	44 (53)	0 (0)
Air (N=24)	4 (17)	7 (29)
Bathroom Floor (N=15)	10 (67)	4 (27)
Bed Rails (N=15)	10 (67)	4 (27)
HVAC Export (N=24)	16 (67)	20 (83)
Clean Linen Storage (N=3)	2 (67)	2 (67)
Soiled Linen Storage (N=3)	2 (67)	2 (67)
Respiratory/Medical ICU		
Air (N=8)	2 (25)	0 (0)
Bathroom Floor (N=5)	4 (80)	2 (40)
Bed Rails (N=5)	3 (60)	0 (0)
HVAC Export (N=8)	5 (63)	7 (88)
Clean Linen Storage (N=1)	1 (1)	0 (0)
Soiled Linen Storage (N=1)	0 (0)	1 (100)
Neurological ICU		
Air (N=8)	2 (25)	0 (0)
Bathroom Floor (N=5)	2 (40)	2 (40)
Bed Rails (N=5)	4 (80)	2 (40)
HVAC Export (N=8)	5 (63)	5 (63)
Clean Linen Storage (N=1)	1 (1)	0 (0)
Soiled Linen Storage (N=1)	0 (0)	0 (0)
Heme/Oncology		
Air (N=8)	0 (0)	0 (0)
Bathroom Floor (N=5)	4 (80)	3 (60)
Bed Rails (N=5)	3 (60)	2 (40)
HVAC Export (N=8)	6 (75)	8 (100)
Clean Linen Storage (N=1)	0 (0)	1 (100)
Soiled Linen Storage (N=1)	1 (100)	1 (100)

Figure 1. Average performance of the 5 moments.



Note. The black horizontal lines below the bars represent the pairwise comparisons between moments with the asterisks reflecting statistical significance. n.s. = not significant (p > .05). * p < .05. ** p < .01. *** p < .001.

Table 1. Linear regression coefficients and confident intervals for transmission outcomes and hand hygiene performance.

	Moment 1 Performance		Moment 2 Performance		Moment 3 Performance		Moment 4 Performance		Moment 5 Performance	
	B	95% CI	B	95% CI	B	95% CI	B	95% CI	B	95% CI
Nurse Contamination	-0.01	-0.04 – 0.03	-0.02	-0.06 – 0.05	-0.004	-0.07 – 0.04	0.04	-0.02 – 0.13	-0.02	-0.09 – 0.03
Patient Critical Site(s)	0.03	-0.01 – 0.06	-0.03	-0.06 – -0.01	-0.001	-0.04 – 0.05	0.02	-0.04 – 0.07	-0.02	-0.07 – 0.03
High Touch Between Room	0.01	-0.03 – 0.04	-0.01	-0.06 – 0.08	0.01	-0.05 – 0.08	0.01	-0.06 – 0.06	-0.03	-0.08 – 0.03
High Touch Within Room	-0.01	-0.07 – 0.07	-0.02	-0.09 – 0.05	0.02	-0.08 – 0.09	-0.03	-0.12 – 0.06	0.01	-0.06 – 0.08

species in both air and surface samples across inpatient units. Higher sensitivity was noted utilizing qPCR, however, identified genera and species were markedly different between qPCR and culture methods. Larger studies are needed to assess the efficacy of qPCR for fungal detection in the healthcare environment.

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Connecting Pathogen Transmission and Performance of the WHO's 'My 5 Moments of Hand Hygiene' in a High-Fidelity Simulation

Paige Gannon, Healthcare Human Factors Lab, Emory University; Rebecca MacKay, Emory University; Kari Love, Emory Healthcare; Bradley Weaver, Emory University; Kylie Burke, Healthcare Human Factors Lab; Victoria Dotto, Healthcare Human Factors Lab; Joselyn Garcia, Chenega Enterprise Systems and Solutions; Angelina Luciano, Chenega Enterprise Systems and Solutions; Brandon Berryhill, 1987 and Joel Mumma, 1987

Background: The World Health Organization launched 'Your 5 moments for hand hygiene' to identify when healthcare workers should perform hand hygiene to reduce healthcare-associated infections (HAIs). Performing hand hygiene correctly is necessary to decrease pathogen transfer, though little research has assessed the effectiveness of all 5 moments. **Methods:** Registered nurses (n=42) participated in a standardized, one-hour high-fidelity patient care simulation that were recorded via a head-mounted camera. The simulation involved two patients, each requiring four clinical care tasks (e.g., indwelling Foley catheter insertion, stool sample collection). Transmission data was obtained from the simulations using four genetic variants of bacteriophage λ. Before each simulation, variants were applied to unique locations on two manikins: patient A's wound, patient A's stool, patient B's groin, and patient B's stool. After each simulation, we sampled the patients, nurse, and high-touch environmental surfaces to determined bacteriophage identity of positive samples. For each moment, hand hygiene performance was the total time the nurse practiced hand hygiene across opportunities over the total recommended time (15 seconds per opportunity). Positive samples were categorized as 1) nurse contamination, 2) patient critical site(s) contamination, 3) high touch surface contamination from the same patient, or 4) high touch surface contamination from the other patient. To compare nurse's performance of each of the 5 moments, we used a Friedman test and then a Wilcoxon test for pairwise comparisons. To assess the relationship between the four types of transmission outcomes and hand hygiene performance of the 5 moments, we performed linear regressions and calculated 95% confidence intervals by bootstrapping the original cases. **Results:** Performance of moments 1 (Before patient contact: 9.49%), 4 (After patient contact: 13.11%), and 5 (After contact with patient's surroundings: 13.66%) were significantly higher than moments 2 (Before clean or aseptic task: 2.72%) and 3 (After bodily fluid exposure: 4.22%; $p < 0$ .05). Moment 2 perfomance, furthermore, was significantly lower than moment 3 (Figure 1). Only moment 2's performance was significantly related to transmission; specifically, performance was negatively related to critical site contamination (B= -0.03, CI 95%: -0.06 – -0.01); Table 1. **Conclusions:** Moment 2performance was the lowest of all 5 moments and was the only moment that demonstrated evidence of