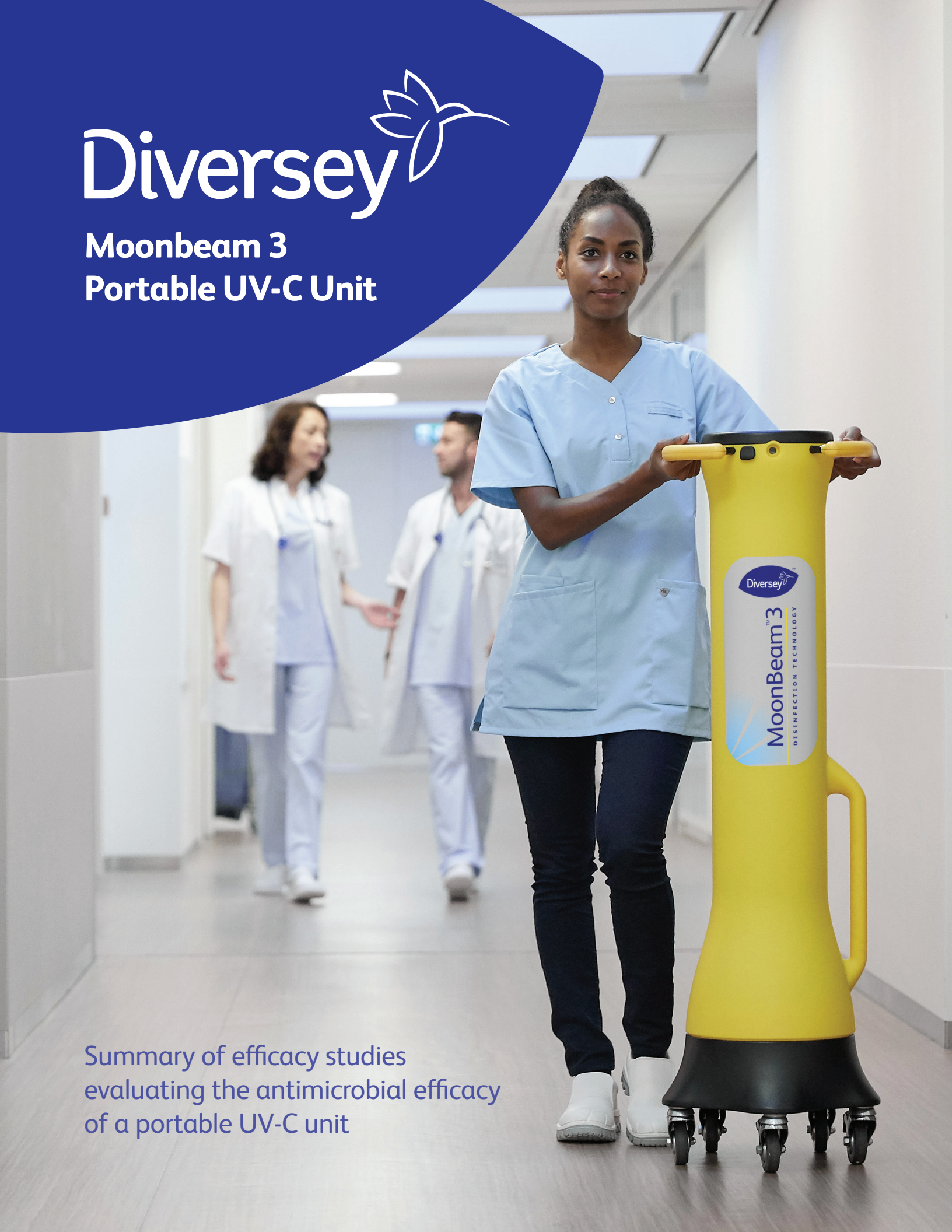
Diversey

Moonbeam 3 Portable UV-C Unit



Summary of efficacy studies evaluating the antimicrobial efficacy of a portable UV-C unit

Introduction

Healthcare associated infections (HCAIs) are a significant source of morbidity and mortality in Europe and globally each year. Environmental contamination in healthcare facilities of pathogenic microorganisms has been found to be widespread and shown to substantially impact HAI risk for patients for certain pathogens (Cohen, 2018) (Otter, 2013.)

Commonly touched environmental surfaces and patient care equipment (collectively surfaces) in healthcare facilities are frequently not cleaned consistently, but often receive a significant amount of hand contact by patients and staff, creating an increased risk of cross contamination for subsequent contact with the surface. Routine cleaning and disinfection of surfaces cannot be relied on to mitigate this risk as cleaning and disinfection is often performed inconsistently. Carling (2008) found cleaning compliance for patient room discharge cleaning was 49% in a study across 23 acute care hospitals with individual surfaces ranging from 20% to 82% compliance across the study.

The challenge in achieving consistently high levels of cleaning compliance has increased interest in the use of ultraviolet (UV-C) light devices as an adjunct technology to provide additional pathogen reduction on surfaces in healthcare facilities. Weber and Rutala (2016) reviewed “no touch” adjunct disinfection technologies, including UV-C systems, and concluded that these systems added value and decreased the risk of certain infections.

For UV-C systems, there have been more than 50 studies in the literature that have demonstrated a reduction in pathogens, a reduction in infection rates, or both, when UV-C systems are used as an adjunct disinfection technology. UV-C energy between 200-400 nm damages microorganisms by damaging the DNA in bacteria and fungi or nucleic acids in viruses, preventing the microorganism from replicating.

For UV-C energy to kill microorganisms on surfaces, an adequate dose of UV-C energy must be delivered to the surface to cause the damage described above. Since the distance from the energy source to the surface and the angle of incidence with which the UV-C light strikes the surface both affect the dose of energy delivered to the surface, controlling these factors in testing is important.

Standardized testing methods never completely replicate the complexities of the real world environment, but are an appropriate method to estimate the likely impact of using an intervention and to allow for comparison between similar interventions.

This brochure summarizes efficacy testing of the Diversey Moonbeam 3 portable UV-C unit run at 3rd party labs using testing protocols developed by Diversey.

Diversey Inc. engaged two third party laboratories that specialize in microbiological testing and provided the testing protocol and the Moonbeam 3 device. To minimize the risk of bias, the labs ran all of the testing and analysis without involvement by Diversey.

The testing conditions and a summary of the results are discussed below.

The Moonbeam 3 portable UV-C device consists of 3 independently articulating lights mounted on a mobile base, allowing the user to direct the UV-C energy on surfaces of highest risk. The unit is operated by a control unit that is placed outside the room and communicates with the base via wireless communications.

Testing Method:

Bacterial or fungal cells and spores or viral cultures were inoculated onto glass slide carrier plates with and without additional organic challenge and dried in an oven using standard microbiological methods. The Moonbeam 3 unit was placed with the center of the closest articulating light head 1.3 meters (4 feet) from a table, approximating the distance from the unit to the center of a patient bed as would be typical of normal Moonbeam operation when treating a patient room. The glass carrier plates were placed on the table and a 3 min cycle was run at normal room temperature (22.2°C/72°F) with each organism run in triplicate. Exposed carriers and controls were taken to the micro lab and processed using standard microbiological methods. Log reductions were calculated and averaged for each organism.

Testing Results:

Test Microorganism	ATCC Number (ATCC or source)	Log_{10} Reduction	Log_{10} Initial
Bacterial Spores			
Clostridium difficile (spore form) (no soil)	43598	3.06	6.39
Clostridium difficile (spore form) (with 5% soil)	43598	3.13	6.40
Mycobacterium			
Mycobacterium Tuberculosis (TB surrogate)	35743	4.04	5.43
Non-enveloped viruses			
Norovirus (feline calicivirus surrogate)	VR-782	4.65	6.20
Poliovirus (Chat strain)	VR-1562	>5.29	5.79
Gram Negative Bacteria			
Acinetobacter baumannii, MDR	BAA-1605	4.74	5.36
Escherichia coli, Carbapenem resistant (CRE)	CDC-81371	>5.12	5.28
Klebsiella pneumoniae, Carbapenem resistant (CRKP)	BAA-1705	3.61	7.64
Pseudomonas aeruginosa	15442	5.45	6.29
Gram Positive Bacteria			
Enterococcus faecalis, vancomycin resistant (VRE)	51575	>4.76	4.76
Staphylococcus aureus, Methicillin resistant (MRSA)	33592	7.46	7.46
Enveloped Viruses			
Influenza A, Strain Hong Kong (1968 outbreak)	VR-544	5.17	6.43
Respiratory Syncytial virus (RSV)	VR-26	>4.18	4.68

Summary of Results:

The testing summarized in this report demonstrates broad bactericidal and virucidal efficacy of the Moonbeam 3 portable UV-C unit against pathogens known to cause Healthcare Associated Infections or that are otherwise important from a public health perspective. Environmental contamination of surfaces in healthcare facilities is a well-established risk factor in the transmission of certain pathogens that can cause HCAIs for patients. Use of the Moonbeam 3 system on surfaces is capable of reducing surface pathogen counts by >3 log (99.9%+) for common HCAI causing pathogens, such as MRSA, VRE, CRE, CRKP, and norovirus.

References:

- Carling PC, Parry MF, Von Beheren SM, "Identifying opportunities to enhance environmental cleaning in 23 acute care hospitals". Infect Cont and Hosp Epidemiol, 2008; 29 (1): 1-7.
- Cohen B, Liu J, Cohen AR, Larson E. "Association between healthcare-associated infection and exposure to hospital roommates and previous bed occupants with the same organism". Infect Cont and Hosp Epidemiol. 2018; 39 (5): 541-546.
- Otter, et al, "Evidence that contaminated surfaces contribute to the transmission of hospital pathogens and an overview of strategies to address contaminated surfaces in hospital settings", Am J Infect Control, 2013; 41: S6-S11.
- Weber DJ, Rutala WA, Anderson DJ, Chen LF, Sickbert-Bennett EE, Boyce JM. "Effectiveness of ultraviolet devices and hydrogen peroxide systems for terminal room decontamination: Focus on clinical trials", Am J of Infect Cont, 2016; 44: e77-e84.

Diversey has been, and always will be, a pioneer and facilitator for life. We constantly deliver revolutionary cleaning and hygiene technologies that provide total confidence to our customers across all of our global sectors.

Diversey is headquartered in Fort Mill, SC, USA. For more information, visit www.diversey.com or follow us on social media.

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