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Oral Communication(s)

EFFICACY OF AN OZONE AND UV-C STERILIZATION SYSTEM ON VETERINARY SURGICAL INSTRUMENTS AND COMPLEX MEDICAL DEVICES CONTAMINATED WITH MDR *KLEBSIELLA PNEUMONIAE* AND *STAPHYLOCOCCUS PSEUDINTERMEDIUS*

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The rising prevalence of multidrug-resistant (MDR) healthcare-associated infections (HAIs) necessitates robust veterinary antimicrobial stewardship, where rigorous instrument reprocessing is fundamental to mitigating nosocomial transmission and reducing antimicrobial reliance [1,2]. This study evaluates the antimicrobial efficacy of a novel sterilization system combining gaseous O_3 and UV-C radiation against MDR *K. pneumoniae* and *S. pseudintermedius*. Two distinct equipment sets were inoculated with fresh clinical isolates (1.5×10^8 CFU/mL) and allowed to form dry surface biofilms to simulate real-world clinical challenges where organic matter protects pathogens. Set 1 comprised 10 stainless-steel surgical instruments featuring complex mechanical joints (box-locks and ratchets). Set 2 comprised 10 heterogeneous devices characterized by complex geometries, internal lumens, and porous materials (laryngoscopes, clipper blades, endotracheal tubes, high-flow nasal cannulas, and non-invasive blood pressure cuffs). Three pre-treatments were assessed before O_3/UV-C exposure: Protocol A (direct packaging, simulating non-compliant omission of pre-treatment), Protocol B (standard decontamination and mechanical cleaning), and Protocol C (complete protocol including mechanical cleaning and high-level chemical disinfection). To isolate the specific bactericidal efficacy of the O_3/UV-C system, a parallel control phase was integrated: devices were microbiologically swabbed immediately after the decontamination phase of Protocols B and C, without subsequent O_3/UV-C exposure. Sterility was assessed via qualitative and quantitative (CFU) microbiological analysis. To detect a significant difference between treatment protocols, an a priori power analysis was conducted. Assuming an expected ozone efficacy of 90% (α error = 0.05), a minimum of 4 devices per group was required; the sample size was increased to 10 to ensure statistical robustness. Under the non-compliant Protocol A, Set 1 (surgical instruments) showed a 40% failure rate, with bacterial persistence localized exclusively within the box-locks and ratchets of articulating tools. Set 2 (complex medical devices) exhibited a 100% failure rate under the same protocol, with significant bacterial proliferation detected across all porous and luminal geometries (median > 100 CFU). Conversely, Protocols B and C achieved total sterilization (0 CFU) across both sets. Post-decontamination controls demonstrated that mechanical cleaning alone was insufficient for sterility, establishing the O_3/UV-C advanced oxidation process as the essential factor for complete bacterial eradication. Statistical analysis via the Friedman test confirmed that the reduction in bacterial load between Protocol A and Protocols B/C was highly significant ($p<0.001$) for both datasets. No statistically significant difference in antimicrobial efficacy was observed between Protocol B and Protocol C ($p>0.05$).

Synergistic O_3/UV-C effectively eradicates MDR *K. pneumoniae* and *S. pseudintermedius*, supporting veterinary antimicrobial stewardship. As organic bioburden shields against O_3 diffusion and UV-C radiation, rigorous pre-cleaning remains a prerequisite for sterilizing instruments with articulating joints, internal lumens, and porous matrices.

[1] Centeleghe et al. Am J Infect Control. 2023;51:1157-1162

[2] Rutala W, Weber D. Am J Infect Control. 2019;47:A3-A9