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Far-UV-C radiation demonstrated germicidal activity against *Escherichia coli* and *Staphylococcus* sp.

M. Sousa [1,2,*], C. Sousa [1,2], M. Vassal [3], D. F. O. Braga [3] and M. Simões [1,2]

[1] LEPABE—Laboratory for Process Engineering, Environment, Biotechnology and Energy, Faculty of Engineering, Department of Chemical Engineering, University of Porto, 4200-465 Porto, Portugal
[2] ALiCE—Associate Laboratory in Chemical Engineering, Faculty of Engineering, University of Porto, 4200-465 Porto, Portugal
[3] SpinnerDynamics, Lda., Rua da Junta de Freguesia 194, 4540-322 Escariz, Arouca, Portugal

* Correspondence: mfsousa@fe.up.pt

Abstract

Background: Bacteria are ubiquitous microorganisms with economic and public health impacts [1, 2]. Proper disinfection of public spaces minimizes bacterial contamination, spread, and associated diseases [3, 4]. Ultraviolet radiation (UV) is an effective and inexpensive approach for bacterial control and eradication [5-7]. **Objective:** This study aimed to evaluate the bactericidal potential of far-UV-C (222 nm) – an irradiation technology requiring scientific validation. **Methods:** The bactericidal effect of far-UV-C (from 104.6 μW/cm^2 to 918.0 μW/cm^2; 222 nm; 1 and 5 min), against adhered cells of *Escherichia coli* and *Staphylococcus* sp., was determined. Ultrasounds (for 1 min), as well as sodium hypochlorite, *N*-alkyl-*N*,*N*-dimethyl-*N*-benzyl-ammonium chloride, pentapotassium bis (peroxymonosulfate) bis(sulfate)), and perillyl alcohol (at sub-bactericidal concentrations for 5 min) were also tested. In addition, irradiation was combined with ultrasounds and each of the four compounds. Finally, the effect of the treatment UV + ultrasound + free chlorine was assessed. The effectiveness of each treatment was evaluated through the calculation of the percentage of reduction. **Results:** For 1 min of exposure to UV-C, percentages of reduction were between 42% and 94% for *E. coli*, while for *Staphylococcus* sp. these percentages ranged from 30% to 91%. For 5 min of exposure to radiation, percentages of reduction were from 79% to 100% for *E. coli* and were between 51% and 99% for *Staphylococcus* sp. Interestingly, the combinations were successful: UV + ultrasound showed synergism and the combinations of UV with each compound resulted in percentages of reduction equal to 100% for *E. coli* and higher than 96% for *Staphylococcus* sp. The triple combination resulted in a percentage of reduction of 100% for both bacteria. **Conclusions:** Far-UV-C reduces microbial contaminations successfully. In particular, combinatorial approaches were more effective than individual treatments, making these treatments adequate for disinfecting public spaces.

Keywords: bacterial contamination; public spaces disinfection; germicidal activity; UV-C light

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