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Inactivation of foodborne pathogens on surfaces by Ultraviolet light emitting diode systems

Studies have demonstrated that environmental contamination through airborne microorganisms can cross-contaminate food contact surfaces which can lead to outbreaks. The efficacy of ultraviolet light emitting diode system operating at 279 nm wavelength for the inactivation of *Escherichia coli* strain (ATCC 25922), *Salmonella enterica* serovar Typhimurium (ATCC 700720), and *Listeria Monocytogenes* (ATCC 19115) on surfaces was investigated. Another important aspect of this study was to evaluate the potential reactivation of UV-injured bacterial cells. A 50µL cell suspension was spread uniformly over a 0.5-inch circular stainless-steel coupon as a droplet and UV treated at fluence levels from 0 to 12 $mJ.cm^{-2}$. The serial dilution method was followed for the enumeration of microbes. Exposures were done in triplicates while plating duplicates. Both *E.coli* and *Salmonella* followed log-linear kinetics, in contrast, *Listeria* followed a non-linear model (Weibull). The fluence required for 4 $\log_{10}$ reduction of the *E.coli, Salmonella,* and *Listeria* was 10.79 ± 0.4, 7.61 ± 0.3 and 5.76 ± 0.2 $mJ.cm^{-2}$ respectively. The data indicate that *E.coli* had lower sensitivity to UV-C compared to *Salmonella* Typhimurium. Conversely, *Listeria* exhibited an initial shoulder followed by a linear response to UV-C. The shape factor (p) and delta (δ) values for *listeria* was mathematically quantified. This study showed that UV LED devices can serve as an additional sanitation method to routine cleaning practices which are commonly utilized in the food industry.