

606a Pulsed Light Inactivation of *Listeria innocua* on Solid Surfaces – Substrate and Spectral Range Effects

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Pulsed Light (PL) is a novel method of treatment that can be used to reduce the microbial populations on the surface of foods and food contact materials. It consists of very intense and short flashes of light with wavelengths from UV to NIR, emitted by Xenon discharge lamps. Despite its approval for surface microorganism control in foods by FDA, PL is not yet commercially used, mostly due to the lack of knowledge regarding the critical factors of influence and the inactivation mechanisms. The objective of this work was to examine the effectiveness of PL and the factors that affect it using a model system consisting of *Listeria innocua* as the challenge microorganism and stainless steel surfaces of factory controlled properties as a model substrate. Stainless steel coupons (2 x 4 in.) with varying finishes were each inoculated with 1 mL liquid suspension containing about 10⁸ cfu/ml *Listeria innocua* cells in the stationary growth stage, and then treated with up to 12 pulses of light. The microbiological data indicated a significant level of sublethal injury of the PL treated cells, and therefore a resuscitation procedure was developed for the accurate quantification of survivors. Survivors were enumerated by both SPC and MPN procedures. The topography, reflectivity and hydrophobicity of the stainless steel surfaces were quantified and then correlated with the degree of microbial inactivation by PL. The inactivation data obtained for the 4 stainless steel finishes indicated a linear increase in microbial reduction when increasing the treatment level from 1 to 3 pulses, followed by a plateau region in the inactivation curve at higher level treatments (6 to 12 pulses). The maximum level of inactivation was about 4-log reduction in *Listeria innocua*. Inactivation levels were comparable for the four different surfaces. It was observed that extremely rough surfaces hindered inactivation due to cell hiding. Surprisingly, a lower than expected level of inactivation was obtained for the smoothest surface, which was attributed to surface reflectivity and cell clumping due to hydrophobic effects. Inactivation data obtained using optical filters indicated negligible microbial reduction for the UVA-VIS-NIR spectral range, suggesting that the major contributor to the lethality of PL lies within the 180nm-315nm range (UVC + UVB). The results of this study lead to a better understanding of the potential, as well as the limitations of PL treatment. Inactivation data suggests that PL can be used effectively for the reduction of surface microflora on foods and food contact surfaces, and also indicates a complex effect of various surface properties on the level of inactivation.