

EVALUATION OF UV-C IRRADIATION TO REDUCE *LISTERIA MONOCYTOGENES* CONTAMINATION IN MEAT PROCESSING PLANTS

C. Rufo^{1*}, G. Brugnini¹, S. Rodríguez-Cortés¹, and Inocuidad, Alimentos y Nutrición,

¹Instituto Polo Tecnológico, Facultad de Química, Universidad de la Republica, Montevideo, Uruguay,

*caterinarufod@gmail.com

I. OBJECTIVES

The effect of UV-C (254 nm) on *Listeria monocytogenes* contamination on the conveyor belts surface of a high-throughput meat processing plant was evaluated.

II. MATERIALS AND METHODS

First, the effect of different doses of UV-C on *L. monocytogenes* survival was analyzed by inoculating Tryptone Soy Agar plates and polyethylene coupons of 150 cm² (clean and with meat remains) with the *L. monocytogenes* strain ATCC19111. Agar plates were inoculated with 10² and 10³ CFU and coupons with 10⁵ CFU. The UV-C dose applied on inoculated Trypticas Soy Agar plates varied from 38 to 229 mWs/cm² and from 76 to 405 mWs/cm² on the polyethylene coupons. After exposure to UV-C, agar plates were incubated at 37°C for 48 h, and then survivor colonies were manually counted. Coupons were sampled with a sterile sponge, the sponge was placed in a sterile bag with 30 mL of Butterfield buffer, and appropriate dilutions were plated by duplicate on agar Palcam and incubated at 37°C for 48 h. In the abattoir, a UV-C germicidal emitting lamp (53 × 20 cm) was placed underneath the meat conveyor belt at 7 cm from the surface. Each belt section received a dose of 593 mW/cm² every 18 min during the deboning process. UV-C effect was evaluated on 3 different days without interfering with the regular plant operation. Swab-surface samples were collected, every 20 min over a period of 7 h, from UV-C–exposed and –nonexposed areas of the conveyor belt surface. Sampling areas surface was of 900 cm². *Listeria* spp., and indicator microorganisms such as total mesophilic aerobic (aerobic plate count [APC]), *Escherichia coli*, and total coliforms from areas exposed and not exposed to UV-C were enumerated on 3M[®] Petrifilm according to the manufacturer's recommendations. Plate counts were expressed as CFU/cm² for APC and as CFU/100 cm² for coliforms, *E. coli*, and *Listeria* spp. Results were log transformed for analysis, and the mean logs for the treatments were compared by a paired *t* test with a significance level of 0.05, using SPSS IBM software (IBM Corp., Armonk, NY).

III. RESULTS

L. monocytogenes reduction of 3 log CFU/plate was obtained in Trypticas Soy Agar plates treated with a dose of 153 mWs/cm² of UV-C radiation. The same UV-C dose in the coupon model caused reductions of 2.1 and 1.1 log for clean and dirty coupons, respectively. In the processing plant, it was observed that the application of UV-C at 163 mWs/cm² on the conveyor belt of the deboning room significantly ($P < 0.05$) reduced *Listeria* spp. counts by 1.2 log CFU/100 cm². UV-C application also produced a significant decrease ($P < 0.05$) of 1.7 log CFU/100 cm² for APC, 1.8 log CFU/100 cm² for *E. coli*, and 2.0 log CFU/100 cm² for coliforms.

IV. CONCLUSION

The application of UV-C on the conveyor belts surface reduced *Listeria* and the overall microbiological contamination of the surfaces that come in contact with meat, contributing to the reduction of the microbiological contamination on the final product. The reduction in the bacterial population on the conveyor belts surface was observed over the 3 sampling days, suggesting that the UV-C effect is independent of the meat plant operating conditions. UV-C treatment of belts surface during production may add an extra hurdle to bacterial contamination.

Keywords: conveyor belt, *Listeria monocytogenes*, UV-C irradiation