Int J Food Microbiol. 2015 Oct 15;211:73-8. doi: 10.1016/j.ijfoodmicro.2015.07.006. Epub 2015 Jul 10.

Ultraviolet-C efficacy against a norovirus surrogate and hepatitis A virus on a stainless steel surface

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PMID: 26184763 DOI: 10.1016/j.ijfoodmicro.2015.07.006

Abstract

In this study, the effects of 10-300 mWs/cm(2) of ultraviolet radiation (UV-C) at 260 nm were investigated for the inactivation of two foodborne viruses: murine norovirus-1 (MNV-1; a human norovirus [NoV] surrogate) and hepatitis A virus (HAV). We used an experimentally contaminated stainless steel surface, a common food-contact surface, to examine the effects of low doses of UV-C radiation on MNV-1 and HAV titers. The modified Gompertz equation was used to generate non-linear survival curves and calculate dR-values as the UV-C dose of 90% reduction for MNV-1 (R(2)=0.95, RMSE=0.038) and HAV (R(2)=0.97, RMSE=0.016). Total MNV-1 and HAV titers significantly decreased ($p<0.05$) with higher doses of UV-C. MNV-1 and HAV were reduced to 0.0-4.4 and 0.0-2.6 log10PFU/ml, respectively, on the stainless steel surfaces by low-dose UV-C treatment. The dR-value, 33.3 mWs/cm(2) for MNV-1 was significantly ($p<0.05$) lower than 55.4 mWs/cm(2) of HAV. Therefore, the present study shows that HAV is more resistant to UV-C radiation than MNV-1. These data suggest that low doses of UV-C light on food contact surfaces could be effective to inactivate human NoV and HAV in restaurant, institutional, and industrial kitchens and facilities.

Keywords: Hepatitis A virus; Modified Gompertz equation; Murine norovirus-1; Stainless steel surface; Ultraviolet-C.

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