

Pulsed ultraviolet light inactivation of pure cultures of indicator and pathogenic bacteria

A.H. Andoh^{a,b}, E.D.O. Ansa^{b,*}, G.A. Ansa^c

^aCSIR Food Research Institute, Box M. 20, Accra, Ghana, Tel. +233 270 153508, email: anthonia2001@gmail.com

^bCSIR Water Research Institute, Box AH 38, Accra, Ghana, Tel. +233 26789 3218, email: edoansa@yahoo.com

^cUniversity of Ghana Hospital, Box LG 79, Legon, Accra, Tel. +233 307 030184, email: nana_akosua@yahoo.com

Received 7 January 2017; Accepted 29 May 2017

ABSTRACT

The effect of pulsed ultra violet (PUV) light on high (10^7 , 10^6 /mL) and low (10^4 , 10^3 , 10^2 /mL) concentrations of pure cultures of *Escherichia coli*, *Vibrio cholerae*, *Aeromonas hydrophila* and *Pseudomonas aeruginosa* were investigated. Further experiments investigated how the efficiency of PUV light may be affected by the distance through which the PUV light may have to travel in water during inactivation (water depth). For pure cultures of approximate concentration of 10^7 cfu/mL, *E. coli*, *A. hydrophila*, *P. aeruginosa* and *V. cholerae* were inactivated completely after 10, 20, 40 and 80 pulses respectively. Treatment of approximate concentration of 10^6 /mL bacteria with 5 pulses of PUV light resulted in 100.00, 99.9975, 99.99991 and 99.99997% of *E. coli*, *V. cholerae*, *A. hydrophila*, and *P. aeruginosa* respectively. For 10^3 cfu/mL, 3 pulses of PUV light treatment were required to inactivate completely all four bacteria. Efficacy of PUV light disinfection decreased with increased water depth. *E. coli* was more susceptible to PUV light treatment than *V. cholerae*. It may therefore not be appropriate to use *E. coli* as an indicator of potability when PUV light is the means of disinfection. *Vibrio cholerae* cells in the exponential growth phase (6 h of incubation) and stationary growth phase (30 h of incubation) responded differently to inactivation by 5 pulses of PUV light, with *V. cholerae* cells in the stationary phase showing more vulnerability to 5 pulses of PUV light.

Keywords: Depth; Disinfection; Drinking water; Growth phase; Potability; Treatment

*Corresponding author.