Quantification transfer rates of foodborne pathogens and its optimal conditions using propidium monoazide - quantitative polymerase chain reaction (PMA-qPCR)

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ABSTRACT

The aim of this report was to review the current research on determining biofilm transfer scenarios on food contact surfaces and optimization of PMA-qPCR options to exclude DNA from dead cells in food processing environments. The presence *E. coli* and *L. monocytogenes* was evaluated using scanning electron microscopy (SEM), confocal laser scanning method (CLSM), PMA-qPCR, microbial analysis test. With the quantification of biofilm transfer was enumerated by using transfer rates (%) and typical logistic model could be used to describe the transfer of biofilm cells as parameters by using root mean square error (RMSE) values, and adjusted coefficients of determination (R^2_{adj}). The results of this review shows that (i) higher attachment of mature *L. monocytogenes* ST9 and ST87 biofilm ($p < 0.05$) compared to adhesion and dispersion stages; (ii) The transmission of *L. monocytogenes* ST9 and ST87 (RMSE: <0.31, and R^2_{adj}: 0.84 – 0.95) biofilm was successful transferred at various biofilm stages; (iii) PMA-qPCR exposure of 650 W intensity with 50 μM of PMA for 15 min demonstrated a better detection than 500 W ; (iv) Long amplicons (1561 bp) were found to be more specific in PMA-qPCR detection than short amplicons (199 bp). In conclusion, PMA-qPCR (650 W, 50 μM of PMA for 15 min combined with long amplicons) proved effective in distinguishing viable and dead cells as well as quantification of *E. coli* and *L. monocytogenes* biofilms in food contact surface and food processing industry. This information could be used to detect the presence of microbiological risk assessment in food contact surfaces and food processing environment.