The application of flow cytometry towards understanding the effects of processing treatments on food borne pathogens

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Abstract

Three common food pathogenic microorganisms were exposed to treatments simulating those commonly used in food processing (E. coli, L. monocytogenes and S. aureus). Flow cytometry (FCM) and fluorescence activated cell sorting (FACS) was carried out on treated cells stained using SYTO9/propidium iodide and DiOC2(3). In parallel, cell suspensions were analyzed for reduction in growth by plate counting. For each microbial species, representative cells from various sub-populations detected by FCM were sorted onto selective and non-selective agar and evaluated for growth and recovery rates. In general, treatments giving rise to the highest reductions in counts also had the greatest effects on cell membrane integrity and membrane potential. In addition, some bacterial species with extensively damaged membranes, appeared to be able to replicate and grow after sorting. Growth of sorted cells from various sub-populations was not always reflected in plate counts and in some cases the staining protocol may have rendered cells unculturable. FCM allowed a greater insight into the extent of the heterogenous bacterial population responses to food control measures compared with traditional plate counts. However FACS was necessary to relate various cytometric profiles with the ability of cells to grow on microbial agar plates. Such information is a prerequisite for more widespread adoption of FCM as a routine microbiological analytical technique. The interference of food particles may also have an effect on viability interpretation and recovery by cell sorting. Recovery rates on selective and non-selective agars after cell subjected to treatments were spiked into a frozen ready meal (vegetable soup) will be further discussed.

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