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Effect of high hydrostatic pressure and thermal treatment on *E. coli* O157:H7 membrane in apple juice during storage

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Abstract

Contamination of juices with pathogenic microorganisms has caused numerous illnesses and some fatalities. Several technologies for non-thermal processing have been commercialized including high-hydrostatic pressure. In this study, the impact of heat and pressure treatment on bacterial cell surface structure leading to injury and inactivation was investigated. *Escherichia coli* O157H:H7 bacteria was inoculated in apple juice to a final 7.8 $\log_{10}$ CFU/ml. Bacteria inoculated apple juice was thermally treated with thermal death time (TDT) disks at 25, 35, 45, 50, 55 and 60ºC for 4 min or pressurized at 350, 400 and 450 MPa at 25, 35, 45, 50, 55 and 60ºC for 20 min. Scanning electron microscopy (SEM) was used to characterized differences between treated and untreated bacterial cell surface structures. Injury and leakage of intracellular- bacterial substances including adenosine triphosphate (ATP) and UV-materials as a function of membrane damage were investigated. Thermal treatment at 55ºC and above and 350 MPa pressure and above led to injury. SEM observation of thermal and pressure treated cells showed differences in damaged bacterial cell structures. Leakage of intracellular UV-materials and ATP of thermal injured cells were lower than the values determined from pressurized cells. Similarly, recovery of thermal injured cells occurred faster than pressurized cells during storage of treated samples at 22ºC. Bacterial cells in pressurized apple juice stored at 5ºC did not recover suggesting that immediate storage after pressure treatment at 5ºC will enhance the microbial safety of the apple juice.

Biography

Dike O. Ukuku got his Ph.D. in Food Microbiology from Wayne State University, Detroit, Michigan, 1995. He is a Fellow of King-Chaves-Parks Future Faculty, 1993, and a Fellow of Japan Society for Promotion of Science, 2006. He was invited to the Membership of Science Advisory Board, 2009-present, a Gold Medalist, for Outstanding public Service 2009, USDA-OPEDA Unsung Hero Award, 2010, Outstanding Technical Achievement for Food Safety, 2012 Award. Has authored or coauthored more than 60 publications. He is on editorial board membership of three scientific journals, has numerous invitations to act as an in depth subject matter expert for manuscripts submitted to scientific journals, as well as Grant programs including USDA's SBIR phase 1, BARD and 1890 Institutions.

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