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Effect of Added Salts on High Pressure Inactivation of *Escherichia coli*

Tomoyuki Fujii

Graduate School of Agricultural Science, Tohoku University

Summary

High-pressure processing is one of non-thermal technique for microbial inactivation, which can inactivate microorganisms without the change in the flavor and nutrient component of foods. Microorganisms in foods are always accompanied with materials including salts, sugars, proteins and other food components. Therefore, it is important to understand microbial inactivation behaviors in presence of coexistent materials. The aim of this study was to analyze the effect of added salts on microbial inactivation by high-pressure treatment. The inactivation behavior of *Escherichia coli* with LiCl, NaCl and KCl by high pressure treatment was investigated.

The cell suspensions of *E. coli* strain K12 were prepared with the salt solutions of LiCl, NaCl or KCl in the concentration range between 0.1 and 0.3 M. The cell suspension was then applied to high pressure treatment at 250 to 400 MPa at 20°C. The viable cell number of high pressure treated cell suspension was counted as colony forming unit to determine the survival curves. Under all experimental conditions, high-pressure inactivation rates of *E. coli* obeyed first-order kinetics. With NaCl and KCl added, the inactivation rate constant (k) showed the minimum value at 0.145 M, which is equivalent to isotonic solution, and it increased with lower and higher osmolarities at the high pressure level (350 MPa in NaCl and 400 MPa in KCl).

The activation volumes (ΔV^*) and the pre-exponential factor (k_0) under the salt concentration were determined from the inactivation rate constant (k). Under lower and higher salt concentrations, the absolute value of activation volume and pre-exponential factor did not depend on salts. These results suggest that the high-pressure inactivation was caused by the osmotic effect under the concentration condition. As a result, with NaCl and KCl, the value of the pre-exponential factor showed the maximum value at the concentration of 0.20 M, increased below 0.20 M and decreased over 0.20 M with increase in concentration. Under the lower and higher salt concentrations the difference in cations would effect on the inactivation behaviors. Under the middle concentration the behavior of the activation volume and pre-exponential factor depended on the difference in salts. In conclusion, this study indicated that there would be different inactivation mechanisms by high-pressure under lower, middle, and higher salt concentrations.