

## Effect of Salts on the High Pressure Inactivations of Protein and Microorganism

Rikimaru Hayashi, Hiroshi Ueno, and Shogo Ozawa  
Laboratory of Biomacromolecular Chemistry, Graduate School of Agriculture, Kyoto University, Sakyou-ku, Kyoto 606-01, Japan

### SUMMARY

The effects of high hydrostatic pressure at sub-zero temperatures were studied on carboxypeptidase Y (CPY). When CPY was treated with pressure up to 400 MPa at room temperature, the enzymic activity decreased progressively; the maximum effect reached to 40% inactivation at 400 MPa. The effects of pressure and temperature were drastically enhanced when temperature was lowered below  $-10^{\circ}\text{C}$  and pressure was maintained at or above 300 MPa, which led to near complete inactivation of CPY. The inactivation of CPY was due to the combination of high pressure and sub-zero temperature. Although the pressure- and sub-zero temperature-dependent inactivation was irreversible at 300 MPa or above, it appeared to be reversible at 100 or 200 MPa. The protective effects of glycerol, sucrose and monovalent cations were also examined. The present study implicates that the changes in interaction between protein and water molecules play the central role in the pressure-induced inactivation of CPY at sub-zero temperature.

Inactivation of *Saccharomyces cerevisiae* by high pressure treatment from 120 to 300 MPa in the range of  $-20$  to  $50^{\circ}\text{C}$  followed pseudo first order reaction kinetics. The regression analysis of 43 inactivation rates showed that pressurization at sub-zero temperatures ( $-20$  and  $-10^{\circ}\text{C}$ ) enhanced the effects of pressure as pressurization at higher temperatures: *i. e.*, pressurization at 190 MPa and  $-20^{\circ}\text{C}$  gave the same effects as pressurization at 320 MPa and room temperature. The results imply that high pressure treatment applied to food sterilization at lower temperatures has a greater effect with smaller pressure without destroying the original taste and flavor. Additional effects of sugars and salts on inactivation of yeast are also described.