

Conservativeness of Functional Proteins in Bovine Milk by Pulsed Electric Field Technology

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Abstract : Unlike the traditional milk sterilization methods (LTLT, HTST, or UHT), pulsed electric field (PEF) technology is a non-thermal pasteurization process. This technology minimizes energy required for heat treatment in food processing, changes in sensory properties, and physical losses. In this study, structural changes of bovine milk proteins, the amount of immunoproteins such as IgG, and their storability by PEF treatment were examined. When the changes of protein content in PEF-treated milk were examined using HPLC, the amounts of α -casein and β -lactoglobulin were reduced over 40% each, whereas those of κ -casein and β -casein did not change. The amount of α -casein in HTST milk was reduced to 50%. When PEF was applied to milk at the energy level of 250 kJ, the amounts of IgG, IgA, β -lactoglobulin (β -LG), lactoferrin, and α -lactalbumin (α -LA) decreased by 43, 41, 35, 63, and 45%, respectively. When milk was sterilized by LTLT process followed by PEF process at the level of 150 kJ, the concentrations of IgG, IgA, β -LG, lactoferrin, and α -LA were 56.6, 10.6, 554, 2.8 and 660.1 $\mu\text{g/mL}$, respectively. When the bovine milk was sterilized by LTLT process followed by PEF process at the energy level of 180 kJ, storability of immunoproteins of milk was the highest and the concentrations of IgG, IgA, and β -LG decreased by 79.5, 6.5, and 134.5 $\mu\text{g/mL}$, respectively, when compared with the initial concentrations of those proteins. When bovine milk was stored at 4°C after sterilization through HTST sterilizer followed by PEF process at the energy level of 200 kJ, the amount of lactoferrin decreased 7.3% after 36 days of storage, whereas that of lactoferrin of raw milk decreased 16.4%. Our results showed that PEF treatment did not change the protein structure nor induce protein denaturation in milk significantly when compared with LTLT or HTST sterilization. Also, LTLT or HTST process in combination with PEF were more effective than LTLT only or HTST only process in the conservation of immunoproteins in bovine milk.

Keywords : pulsed electric field, bovine milk, immunoproteins, sterilization

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