

Temperature dependence of the casein micelle structure in the range of 10–40 °C: an in-situ SAXS study

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要旨

Milk is used and processed under various environmental temperature, and its physicochemical properties are also strongly affected by temperature. Therefore, it is important to reveal the structure of milk at variable temperatures. In this study, the temperature dependence of the inner structure of bovine casein micelles in the temperature range of 10–40 °C was investigated by in-situ small-angle X-ray scattering (SAXS) method. The micelle size calculated from the SAXS profiles using a micelle model including water domains was almost independent of temperature. The water domain expanded and the distance between the colloidal calcium phosphates (CCP) decreased with increasing temperature. The number of CCPs in a micelle increased, because CCPs were newly formed by the transfer of calcium and inorganic phosphate from serum into the micelle. These structural changes occurred during the cooling process. Therefore, in the temperature range of 10–40 °C, the structure of the casein micelle varied sensitively with the temperature, and these structural changes were thermoreversible in nature. Three xylanases induced by xylan from *Streptomyces* sp. no. 3137 were purified to homogeneity. The enzymatic, physicochemical, and immunological properties of the enzymes were compared with those of three xylanases induced by non-metabolizable methyl β -xyloside. It was found that each xylanase produced under different culture conditions showed very similar properties.