

A study on a casein micelle structure using SAXS and SANS ; revealing the origin of changes of micelle structure by heat treatment

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The bovine casein micelle has been extensively studied over past decades, but the details of its inner structure have not yet been definitively identified. Importantly, the physical properties and processabilities of milk are strongly influenced by temperature and pH. Milk, an integral dietary component consumed worldwide, undergoes processing in various environments where temperature and pH play crucial roles in shaping its properties and processing capabilities.

Milk is usually pasteurized at high temperatures. It has long been known that this sterilization temperature has a significant impact on the subsequent processability of milk. The structural changes of casein micelles were investigated using small angle neutron scattering (SANS).

Fresh row milk was heated at 65, 75 and 85 °C for 30 min. All samples were freeze drying. Reconstructed milk obtained by adding D₂O = 100 % into freeze-dried skim milk were used as samples.

Fig. 1 shows SANS profiles of sterilized milk at 65, 75 and 85 °C. Broad scattering peaks were seen at $Q = 0.04, 0.35$ and 0.8 nm^{-1} . These scattering peak positions were good agreement with earlier studies. However, scattering peak positions of $Q = 0.15 \text{ nm}^{-1}$ were changed by pasteurization temperature. Previous studies have shown that scattering peaks were seen at $Q = 0.04, 0.35$ and 0.8 nm^{-1} in SANS, whereas $Q = 0.04, 0.15$ and 0.8 nm^{-1} at in SAXS [1]. Therefore, our results revealed that the scattering peak of $Q = 0.15 \text{ nm}^{-1}$ was observed in SANS. These results are currently being analyzed.

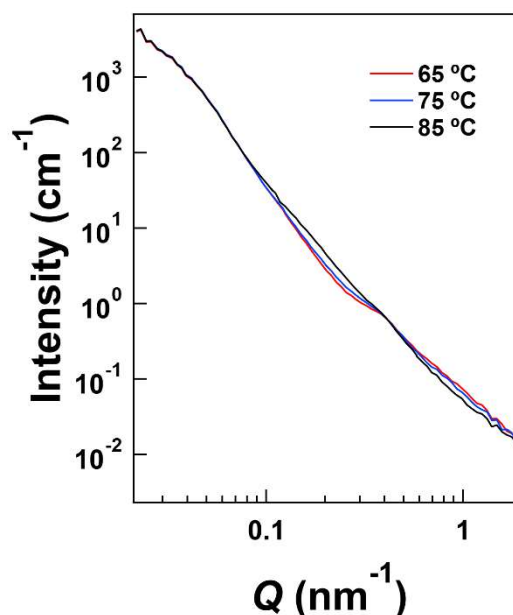


Fig. 1. Fig. 1 shows SANS profiles of sterilized milk at 65, 75 and 85 °C.

- [1] H. Takagi *et al.*, Food Chem., **393**, 133389 (2022).
- [2] H. Takagi *et al.*, Soft Matter, **19**, 4562 (2023).