Infusion pasteurization of whole milk and skim milk: Influence on viscosity and particle size

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ABSTRACT

Infusion pasteurization is under investigation as a new, gentler method for heat treatment of milk as compared to pasteurization at 72°C for 15 seconds. Infusion pasteurizations were performed in the temperature range from 72°C to 120°C on both whole milk and skim milk. Changes in the physical properties, here evaluated by particle size and viscosity, were observed in the skim milk fraction of whole milk, whereas no changes were seen in skim milk.

INTRODUCTION

Milk needs to be heat treated in order to ensure consumer safety and obtain a reasonable shelf life. The standard treatment for fresh milk products is low pasteurization in a plate heat exchanger at 72°C for 15 seconds. However, new technologies for heat treatment of milk are under investigation with the aims of obtaining gentler treatment; preservation of freshness; longer shelf life; and development of new products differentiated from existing products. Infusion pasteurization is a technology characterized by short heating, holding and cooling times that might create possibilities for fulfillment of at least some of these aims.

EXPERIMENTAL

Infusion pasteurization was performed on both whole milk and skim milk and at different temperatures in the range 72°C-120°C. The skim milk was prepared at a commercial dairy and had been heated to approx. 60°C during the separation process. The whole milk was skimmed by centrifugation prior to the analyses. In the analyses, the infusion pasteurized samples were compared to a standard low pasteurization on the same batches of milk and samples of the raw milks. Particle sizes were analyzed using dynamic light scattering, and the viscosity of the samples were measured with a capillary viscometer.

RESULTS

The viscosity measurements showed no significant changes in viscosity after infusion pasteurization of skim milk, nor did the particle sizes change. On the other hand, when whole milk was infusion pasteurized an increase in viscosity of the skim milk fraction was seen as treatment temperature increased, and an increase in the z-average diameter of particles and broadening of the size distributions was observed. These observations were quite surprising and might be the result of influence of several different processes during and after infusion pasteurization.

The observed differences and changes in the analyzed physical properties suggest that infusion pasteurization might have potential for application in production of dairy products with altered and different functionalities.