

Study on casein micelles in raw milk with different levels of somatic cells by scanning electron microscopy

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Mastitis deteriorates the quality of raw milk and higher proteolytic activity in mastitic milk has been reported. There are no published studies on the effects of health status of the animal on the casein micelle microstructure, therefore the specific objective of this study was to determine the effects of somatic cell count (SCC) on the dimension and microstructure of casein micelles in raw milk. Raw milk samples were collected from the individual quarter of the dairy cattle in three different levels of SCCs (i.e., low: $SCC < 200,000$, medium: $200,000 < SCC < 800,000$ and high: $SCC > 800,000$ cells/ml) and prepared for study by Scanning Electron Microscopy (SEM). The results suggested that the size of casein micelle changes in mastitic milk, and there were significant differences in casein micelle microstructure between high and low SCC milk samples. The mean diameter of micelles in medium and high SCC specimen decreases dramatically and SEM micrographs revealed that aggregation of casein micelles increases considerably in raw milk samples, especially in high SCC milk, except for that of low SCC. Increase the activity of proteolytic enzymes such as plasmin and lysosomal enzymes (Elastase, Cathepsin B, D and G, etc) was realized as the main reason of hydrolyzing casein in milk, especially in milk with high SCC, which can be the cause of changes in size and tendency to aggregation of casein micelles in mastitic milk. In addition, decreased milk synthesis ability and reduced steric and electrostatic repulsion among casein micelles might be other causes for this phenomenon.

Keywords: Somatic cell, Raw milk, Scanning electron microscopy, Casein micelle

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