

RECENT ADVANCES ON CASEIN MICELLE STRUCTURE-FUNCTION PROPERTIES

Abstract

This presentation will focus principally in: (i) Overview of the Research and Teaching activities in the Department of Food Science at The Pennsylvania State University and possibilities when possible of research collaboration and student exchange with PUC, (ii) Highlight recent advances in our understanding of the structure-function properties of casein micelles from bovine milk.

“Casein micelles” are protein quaternary structures of about 150 nm diameter prevalent in milk. A relevant biological function for the casein micelles is to transport calcium from mother to young. Evidence of this native function lies on the fact that milk is super saturated with calcium and the phospho-serine residues responsible for holding calcium phosphate clusters are conserved throughout mammals. Recent cryo-EM studies demonstrated a sponge-like inner structure with internal channels and cavities and FPLC-MS studies demonstrated the native binding affinity of casein micelles towards low molecular weight hydrophobic molecules (e.g., sphingomyelin). The exposure to physicochemical stimuli (e.g., pressure, shear, solvents) drastically changes the inner protein conformation of the casein micelle, ultimately changing quality and yield properties of traditional dairy products (e.g., cheese, yogurt) and fostering novel functionality (e.g., polysaccharide interactions). Although human have been milking mammals for at least 9,000 years, key aspects of the structure and function of milk proteins remain under discussion.

The fundamental understanding of the casein micelle nano-structure will have a deep impact on the technological relevance for both food and pharmaceutical applications.

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