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Phosphoproteomics of milk lipid droplet proteins: New insights into lipid droplet secretion from the mammary epithelial cell

Christelle Cebo

Université Paris-Saclay, France

Lipid droplets are secreted into milk by a complex process which begins by burgeoning of lipids at the endoplasmic reticulum of the mammary epithelial cell (MEC). Lipid droplets enveloped by organelle-derived phospholipids reach the apical pole of the cell where they are wrapped by the plasma membrane to be secreted as fat globules into milk. Analyzing the fine protein composition of the Milk Fat Globule Membrane (MFGM), the triple-layered membrane surrounding milk lipid droplets can therefore provide mechanistic clues to better understand lipid droplet biosynthesis and secretion pathways. We combined a high sensitive Q Exactive LC-MS/MS analysis of MFGM-derived peptides with the use of an *in-house* database intended to improve protein identification in the goat species. Using this approach, we performed the identification of 442 functional groups of proteins in the MFGM from goat milk. To get a more comprehensive view of intracellular mechanisms driving lipid droplet dynamics in the MEC, we decided to investigate for the first time whether MFGM proteins were phosphorylated. A phosphopeptide enrichment approach let us pinpoint 271 sites of phosphorylation on 124 unique MFGM proteins. We are now investigating the putative role of these phosphosites with regard to lipid droplet biology by using site-directed mutagenesis studies in cellular models.

christelle.cebo@jouy.inra.fr

Real-time evaluation and on-line separation of milk according to its industrial properties

Gabriel Leitner¹, Dror Bezman², Liubov Lemberskiy-Kuzin², Uzi Merin^{1,2} and Gil Katz²¹Ministry of Agriculture and Rural Development, Israel²Afimilk, Israel

The structure of the milk industry is going through extensive changes in the last decade; while the number of farms is dropping, the average number of animals in each farm is increasing sharply. Modern dairy farms employ high level of automated computerized data acquisition by sensors installed in the dairy parlor or on the individual cows. This data is utilized in the management system to support decision making in high precision farming. New emerging technologies are an opportunity to assume new characteristics for quality by addressing the raw material potential for high quality and yields of the end product. Cheese making economics maximize yields and quality through efficient recovery of milk constituents and minimizing constituent's losses in the whey. Raw milk efficiency for cheese manufacturing is determined mainly by the level of milk constituents and its coagulation properties. A new approach for on-farm control of bulk tank milk properties for cheese manufacturing is presented. Afilab™ milk spectrometer (Afimilk, Afikim, Israel), evaluates coagulation properties in real time during milking, then channels each pull of milk into one of two different bulk tanks A and B, depending on predetermined required traits, and provides on-line information on each cow's milk yield, milk composition and clotting parameters. Using the system in commercial dairy farms resulted in a significant increase of about 10-15% of the cheese vat yield resulting in increased profitability.

leitnerg1@gmail.com