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Editorial: Genetic factors affecting the nutritional and processing quality of milk

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Editorial on the Research Topic
Genetic factors affecting the nutritional and processing quality of milk

The studies on the effects of genetic factors on milk composition and properties have changed dramatically since the introduction of the so called "omic" sciences. In this Research Topic, it is highlighted how the use of genomics, proteomics and nutrigenomics approaches may help to better investigate milk quality at the gene level. Furthermore, the potential of prediction methods based on the analysis of milk spectra was also investigated to assess the processing quality of milk.

The coagulation ability of milk is essential in the dairy sheep industry because milk is mostly processed into cheese. The cheese-making quality of milk is usually assessed by the measurement of rennet coagulation parameters (RCP). Milk with good RCPs has higher cheese yield and quality (De Marchi et al., 2008). Conversely, non-coagulating milk (NCM, milk not forming a curd within the testing time) impairs achievable cheese yield and profit. Prediction of NCM with rapid methods could allow the use of this parameter in dairy sheep breeding programs. In this regard, Gaspa et al. showed how the analysis of mid-infrared (MIR) spectra of milk is a promising tool to predict NCM. The use of genomic methods was investigated by the same authors to identify potential genes involved in NCM.

The two most widespread genetic variants of beta-casein in bovine milk are A1 and A2. This polymorphism has gained a lot of attention in the last 20 years because of the possible involvement of the A1 variant in non-transmissible diseases on humans (Summer et al., 2020). To date, no negative effects of A1 consumption on human health were detected by official bodies (EFSA, 2009). Despite this, some dairy companies worldwide have started cow milk production, making only A2 milk. Following a genomic approach, Scott et al. reported how the selection of A2 cows could potentially reduce genetic diversity in dairy cows, increasing the level of inbreeding with negative repercussions on fertility.

The polymorphism of caseins influences the processing and nutritional quality of goat milk (Selvaggi et al., 2014). Genetic variants of alpha-s1 casein were

associated to different levels (from high to null) of expression of the corresponding protein. Santillo et al. highlighted how the level of expression of alpha-s1 casein was positively associated with the activity of plasmin, the main endogenous proteases in goat milk. This could have important repercussions on the cheese-making quality of milk, because plasmin is directly involved in proteolytic reactions that take place during cheese ripening.

Supplementation of dairy ruminants with specific feed additives is used to improve the nutraceutical quality of milk (Savoini et al., 2019). As a matter of fact, it is well known that diets also affect the expression of genes of the mammary gland. Cremonesi et al. reported how the supplementation of dairy goat with linoleic acid increases the quality of milk fatty acids (increased concentration of polyunsaturated fatty acids and reduced n-6/n-3 ratio). Following a nutrigenomic method, they highlighted how supplementation also affects the expression of genes of the mammary gland involved in metabolism and in immune responses to inflammation.

Author contributions

MM wrote the manuscript. All authors contributed to manuscript revision, read, and approved the submitted version.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Publisher's note

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