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**CANDIDATE GENES AFFECTING MILK QUALITY AND DAIRY PRODUCTIONS**

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*milk quality, candidate genes, milk proteins*

Recently quality has become the most important breeding goal in the milk production system. Milk quality is a very broad concept since milk is not only a food but the raw material for a wide variety of dairy products as well. Moreover among the quality aspects can be included not only the nutritional values but also the capability to provide health benefits (i.e.: functional properties) and the satisfaction of the consumers demands. Quality relies also in the production system that has to be environmentally sustainable and concerned about the animal welfare. Finally specialised local dairy products as a result of tradition and practice have to be considered in the quality concept.

In a different extent all the quality aspects are affected by the genes and for all of them it can be hypothesised they are quantitative traits. The initial approach to enlighten the genetic determination of these traits has considered the search of correlation between polymorphisms at protein level and milk quality. Many variants at protein level and subsequently at DNA level have been observed and characterised for all the four caseins (CSN1S1, CSN1S2, CSN2, CSN3,) and in all the milking species. The casein variants, extensively studied since their discovery, are considered as candidate genes for milk quality. Relevant effects are ascertained in cattle and goat on milk quality and particularly on the protein content and on the cheesemaking properties. For both the species according to the breed and the country the genotypes at casein loci are considered in the gene-assisted selection schemes.

The two serum-proteins (beta lactoglobulin and alpha lactoalbumin) were also investigated for their effects on milk quality. Beta lactoglobulin is associated with milk production traits and cheese yield in bovine and influence the technological properties in sheep though without a clearly definite conclusion. Besides the production and the technological properties, one of the most interesting aspects is that the milk proteins are involved in human allergenic and immunological process. Other genes like SDC and DGAT1 affect milk fatty acid composition and fat yield protein yield and total.

So far candidate genes have been chosen according to their function or position. Nowadays thanks to the development of advanced methods in genome analysis, like the microarray analysis, candidate genes could be found by transcriptome analysis.

Since the cosmopolite breeds were intensively selected for traits negative related to the quality, local or autochthonous breeds represent useful genotypes and may be reservoirs of alleles important for milk quality.