

# Pro Caseus: Selecting for Milk with Better Cheese-Making Properties

Cheese production is big business in Italy. And when it comes to the production of quality cheese, cow's milk is not all the same. Now one Italian AI company has come up with a new way to identify and breed for cows that produce milk that has superior qualities for cheese-making.

DOUG SAVAGE

Intermizoo is an Italian bull stud that was established in 1974 and has its head-office in Padova, not far from Venice. In 2011, all bull housing and semen production was transferred to facilities at Brussa Carole on the opposite side

of Venice, to the east. This seashore location is far removed from major livestock regions, the isolation providing a natural barrier to disease causing bacteria. 200 young bulls are housed in two barns, while the impressive main barn

for mature bulls is fully air-conditioned for bull comfort and to ensure good semen quality year round. Over the years such big-name bulls as Sabbiona Bookie, Alzi Juror Ford, Boss Iron and New Farm Britt Prince have been products of

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The state-of-the-art bull barn at Intermizoo, complete with air conditioning. The new Pro Caseus indexes will be exclusive to Intermizoo bulls.



the Intermizoo program. Today chart toppers such as Go-Farm Miura and Parallel-P, and the genomic bulls ZFZ Crialis-RC and Tirsvad Geyser-P, are the stars on the Intermizoo label.

## SPECIALISTS

In Italy, around 75% of milk is used in cheese production. Italy is renowned for the production of specialty cheeses so who better to develop a new way of breeding for animals that will produce milk with superior cheese-making qualities. The protein kappa-casein has long been recognized as a significant factor impacting the cheese yield of milk. However, the cheese-making qualities of milk go much further than just the quantity of cheese it yields: The time for milk to coagulate, the consistency of the curd, the firmness of the curd, and the keeping ability of the cheese and a number of other factors can all be impacted by the milk that is used.

## DIFFERENCES

It has been known for some time that kappa-casein does not explain all the differences that exist in regards the cheese making qualities of milk. 'I can say that not all the kappa-casein BB bulls have the same ability to produce cheese; sometimes we see some kappa-casein AB bulls that can be better than some kappa-casein BB bulls,' comments Francesco Veronese from Intermizoo. His colleague Martina Dal Santo gives us some background on Pro Caseus. 'Back in the 90s, researchers found that the coagulation qualities of milk were dropping. They also found big differences between breeds, with the Holstein being the worst, and big differences within breeds.' Around a third of tank milk did not curdle, with significant breed differences: 55% of Holstein milk did not curdle, 23% of Simmental milk did not curdle, while for the local Rendena breed, just 4% of milk did not curdle.

## PHENOTYPE

In 2007, Intermizoo and the University of Padova started data collection with the assistance of the regional production recording laboratory. About 2,000 milk samples were analyzed using lacto-dynamograph technology which looks at rennet coagulation time, curd firming time, and curd firmness. The lacto-dynamograph simulates a real cheese-making process, where the milk changes from a colloidal suspension to a gel. The 10ml milk sample is warmed to 35°C, then rennet is added and the lacto-dynamograph simulates the coagulation process. This data made possible the creation of the first phenotypic index for cheese-making aptitude, and Intermizoo published its first catalogue of its cheese-making aptitude bulls in 2012. Starting in 2011, the testing of all milk samples at the regional laboratory for cheese-making ability became routine, and they continue to collect this data, now totaling around 4 million milk samples analyzed.

## TRIALS

During the cheese-making trials in 2007, milk from cows that had tested as poor for milk coagulation was kept separate from the milk from cows that had tested as having excellent coagulation qualities. That enabled the production of two different types of cheese. During the milk curdling process and cooking, the excellent coagulation milk had a lower processing time and there were fewer instances where correction was required. During the cheese aging, cheese from the excellent coagulation milk had a higher yield by 8.6% at 48 hours, increasing up to 9.5% after 6 months of aging. Moreover, 90% of cheese from excellent coagulation milk was marked as "premium quality", compared to only 35% for the cheese from poor coagulation milk.

## GENOMICS

The phenotypic index for cheese-making aptitude was only available for Intermizoo proven bulls that had milking daughters in the Veneto

region. Then, thanks to genomics, the research group headed by Professor Cassandro published their pioneering study of 100 genes linked to cheese-making aptitude. By merging the phenotypic information with a genomic analysis, Intermizoo and the University of Padua created the first genomic index for cheese-making aptitude, which was named Pro Caseus. Both words "Pro" and "Caseus" are Latin words: Pro means "in favor of", while Caseus means "cheese" and is the Latin root of many words including cheese and casein. The Pro Caseus index is now patented and is available for bulls, cows and heifers which can be tested via hair, blood, semen or nose swab samples.

## QUANTITATIVE

'As you can see, cheese-making aptitude is a quantitative trait, meaning that it involves many different genes,' points out Martina. 'Moreover, in cheese-making aptitude not only genetics but also environment and management are involved, including lactation curve, seasonality and the acid titration of milk.' She goes on to point out that the heritability for rennet coagulation time is 0.25-0.28, while curd firmness is 0.15-0.41, which is a similar range to other milk quality parameters such as fat% and protein%. 'The high variability within breed and the good heritability are the two main factors that allow selection and improvement for this trait,' she adds. 'Pro Caseus is easy to use. The index is expressed with a base of 100 and a standard deviation of 5, so an index higher than 100 indicates a bull that will improve this trait. Pro Caseus can also be calculated for cows and heifers, and selection should result in herd improvement within one or two generations of cows.'

## BULLS

All bulls listed in the Intermizoo lineup now have their Pro Caseus index displayed. 'Our genomic bulls have their own Pro Caseus genomic index, while the proven bulls have a Pro Caseus index that is a blend of their genomics and EBV,' comments Francesco. 'Now all our bulls in pre-selection are genomic tested for Pro Caseus, and bull mothers are also genomic tested. Now I'm using our best Pro Caseus genomic bulls on the best Pro Caseus females to create the next generation of young bulls, so we are expecting to see significant improvement in the cheese-making aptitude of our bulls in the future. Our Pro Caseus bulls we are currently using as sires of sons are Dubliner (108 PC), Redkiss (114) and Hipster (108). They combine a very good Pro Caseus index with complete and high conventional indexes too.' Francesco expects to see further developments in cheese-making aptitude. 'Pro Caseus is a very dynamic subject and we expect to see more updates as it evolves in the coming months.' Stay tuned to this space for further developments to Pro Caseus in the future! ●