



Montbeliarde :
Bred for the French
cheese Industry

The main use of milk in France is cheese making and France is recognized widely and internationally for its high quality and diversity of cheeses. It looks like a detail but the cheese industry allowed a lot of mountain areas to sustain economically thanks to their pastures and cows herds. Areas like Alps, Jura, Pyrenees, Massif Central and Vosges are renowned for their specific cheeses that keep local activities in hard access regions. More recently, changes that are affecting the dairy industry lead to more added value products such as cheese, which gives new opportunities for that industry.

To achieve better economic efficiency, dairy farmers of the Montbeliarde area (Central east of France) organized themselves for decades around local cooperatives running small cheese plants called “Fruitières”. There, dairy farmers sell cheese instead of milk and developed strategies to get a better product, increasing cheese yield (on the cow side) and increasing the quality and flavour of cheese (process side). All this led to a maximum of added value and made “Comte” cheese the N°1 high quality cheese in all France for years (45.000 tons/year). The genetic side is important and several scientific studies demonstrated it. The cheese process depends a lot on both bacteriological and organoleptical milk quality.

A- Factors influencing Cheese Yield

1-Protein content

Cheese Yield is proportional to milk % of protein up to 3,8%. Above that figure, cheese yield doesn't increase significantly.

2-Casein type.

Casein is the principal protein in milk. During the cheese making process, casein solidifies, curdles or coagulates into cheese through the action of rennet. Several types of casein exist but Kappa casein is definitely one of the most important for cheese making.

Kappa Casein

There are several forms of kappa casein – A, B and E – that are associated with milk protein and quality. Of greatest importance are the A and B variants which are related to renneting process/time-to-coagulate for cheese production. Studies have also shown that cheddar cheese yield can be up to 8% higher and mozzarella up to 12% higher with BB milk versus AA milk. The E variant has generally been shown to have an adverse effect on cheese production. The presence of the B variant confers a benefit, no matter what the other genotype is.

- BB : preferred result for cheese production
- AB and BE : intermediate for cheese production
- AA and AE : least favourable for cheese production

3- Fat content

When there is an excess of fat (Jersey Milk) in relation to casein, weak bodied cheese with a higher fat content in the dry matter is produced. On the other side, lack of fat content leads to series of problems like poor flavour and lack of cheese elasticity.

4- Somatic Cell Count

Any increase in milk SCC above 100,000 cells/ml has a negative impact on cheese yield efficiency because protein are transformed and lost in whey. Cheese moisture also increases with milk SCC. Milk quality is absolutely key in cheese process operations and selecting genetically cows that will have less mastitis and lower somatic cell count play a major role for the cheese industry.

B- Montbeliarde : the French cheese maker breed

Originated from the Jura mountain area of France, Montbeliarde dairy breed has been modelled over the last 200 years to fit a grazing system in order to produce high quality milk. The most known cheese of France (Comté Cheese) is made from that area with Montbeliarde milk exclusively. More than 45.000 tons per year are produced for both domestic and international markets.

In phase with the strategical importance of cheese production in the region, breeders and genetics leaders decided in early XXth century to select and focus the Montbeliarde breed into producing an adapted milk for cheese process.

1- Specific genetic goals for cheese production

For a long time, natural selection for milk and mastitis resistance has been important for Montbeliarde breeders. But since the 50's, Progeny Testing has allowed breeding improvement on various traits such as :

- Quantity and percentage of milk protein (kg and %)
- Increase of the Kappa casein B allele presence in the population.
- Increase of mastitis resistance and therefore lowering SCC
- Control of fat content and thus increase Protein/Fat ratio to reach 1 as an ideal figure.
- Include all those goals into a global Genetic Index called ISU (See Table 3)

2- Response to genetic selection

- Montbeliarde increased 800 kg of milk and 0,9% of protein per lactation in the last 10 years (See table N°2).
- The introduction of B allele for Kappa-casein (Started 1980) allowed a 15% increase in the last 5 years. As a result, 75% of Montbeliarde sires in 2006 Coopex Montbeliarde Sire Directory show AB or BB combination for Kappa Casein.
- Montbeliarde breed shows 36% less SCC in 3rd Lactation compared to Holstein. (See Figure N° 1- INRA 2003).
- Fat content control. Goals for Montbeliarde breed don't consider fat content increase but stabilization around 3,9%. Increasing protein/fat ratio appears more important and Montbeliarde shows best figures among main dairy breeds. (See Table N°1)

C- Montbeliarde Diffusion in France

Thanks to its cheese aptitudes but also production, fertility and longevity, the Montbeliarde breed is the only one that experienced a domestic population increase in France over the last 25 years with an impressive + 86% among cows under test (See table N°2).

The Montbeliarde breed is used in numbers of high quality cheese productions all over France :

Comté cheese : made in Montbeliarde area, 45.000 tons/year

Cantal cheese : central France, 19.000 tons/year

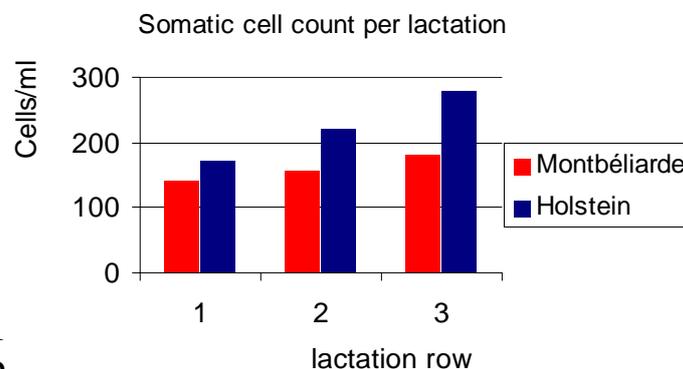
Reblochon cheese : south east France, 16.500 tons/year

Mont d'Or cheese : Montbeliarde area, 3.200 tons/year

Abondance cheese : south east France, 777 ton/year

In addition, Montbeliarde transmits a nice and healthy cow image to consumers, which makes her interesting not only in Cheese production regions but also in areas like western France (Brittany) where dairy industries look more than ever for better quality milk.

Figure N°1 - Official datas for SCC (Montbeliarde, Holstein)



- 18% in L 1
- 30% in L 2
- **36%** in L 3

