Lactose in milk – How can lactose concentration data be beneficial in management and breeding?

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Abstract

Lactose is major component of milk dry matter, but it has by tradition not been highly valued. More recently, dairy processors have invented methods to refine lactose and found markets that pay well for refined lactose. However, in Denmark, milk payments are based on kilo fat and kilo protein and a negative price on volume, but without adjustment for lactose content. For herd management, the requirement of individual cows depends on all components in the milk, often summarized as "energy corrected milk, ECM" where the lactose accounts for around 750 kJ of the 3140 kJ/ Kg ECM, or 24% of the energy in Holstein milk and 18% in Jersey milk. The 24% and 18% are average fractions that varies between cows and within cow with lactation stage and parity number. Also, results from controlled studies have shown how feeding can affect lactose concentrations in milk. These effects are often hidden because lactose is not measured in milk from test days, despite that the results can be obtained by simply switching on this option on the infrared analyzer instruments.
Feeding rations with higher energy concentration, either with higher concentrate proportion or with forages with higher digestibility, resulted in increases in milk lactose concentrations between 0.05 and 0.10 % units.
There are systematic effects of parity so that older cows with higher yield have less lactose in their milk than first parity cows. During lactation, lactose percentage follow the shape of the yield volume curve, so that peak concentrations are found at 50 to 70 DIM, followed by a steady decline, in parallel between first and later parities. Systematic breed differences are small between Red Danish Cattle and Holstein but Jersey have somewhat lower lactose concentrations than the larger sized cows.
Lactose concentrations are much less variable that fat or protein concentrations, but individual differences were clearly detected with repeatability estimates in the range of 0.70 up to 0.90, within lactation. Estimates of heritability are scarce in literature and results from experimental herds show estimates in a range similar to that of protein concentrations. There is clearly a lack of estimates for heritability, but more importantly estimates of genetic correlations to other production traits or health traits are very few.
In conclusion, there is a need to investigate how lactose from test day samples can benefit management and breeding, so large volumes of data to support this should be obtained from simple expansion of the range of milk components determined in the test day schemes.

Keywords: Lactose, ECM, test day samples, feeding, genetics