NTM ensures a balanced breeding – an example of udder health and milkability

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Although we know that many traits are important for the economy of the farm, breeders easily tend to focus on conformation, milk yield or some other trait that is easily measured and visible to the farmers' eye. The obvious problem connected to the approach of focusing on few traits only is that it does not ensure best economic result. Also, due to unfavourable genetic correlations between traits, selection just in one or few traits can cause unwanted progress in others.

To determine whether an animal has good genes is not possible just by looking at it. That is the reason we use breeding values since they combine all available phenotypic and pedigree information. This is however not enough since single breeding values do not reveal the effect that selection will have on other traits or on the overall economy of the cow. For this we need an overall index, such as NTM.

By using bulls and cows with high NTM, it is ensured that all economically important traits are considered which will give you profitable cows. NTM also takes into account that traits are correlated to avoid unexpected and unwanted results.

An example of breeding for milkability and ignoring udder health

Both udder health and milkability are traits that are included in the breeding goals for major dairy breeds in the Nordic countries. However, unfavourable genetic correlations exist between the two traits making it more difficult to improve them at the same time. A negative value for the correlations between milkability on one hand and mastitis or somatic cell count on the other, imply that in general bulls with high breeding values for milkability (faster milking) have low breeding values for the udder health traits (more mastitis and higher somatic cell count, scc). This general association can be seen when studying the correlations of EBVs of bulls having an official NAV evaluation (see Table 1).

Somatic cell count does not have an economic weight in NTM. However, scc is used, together with udder depth and fore udder attachment, as an indicator trait to improve udder health. Scientific studies have found that genetic correlations between clinical mastitis and somatic cell count vary from approximately 0.40 to 0.80. Average correlations are around 0.60 indicating that somatic cell count is not exactly genetically the same trait as mastitis, but they are highly correlated. Elevated somatic cell count level existing for a longer period of time may indicate subclinical chronic mastitis. However, in some cases these cows are never treated for actual mastitis if their symptoms are mild. Due to higher heritability and to a strong connection to mastitis somatic cell count gives important information in estimation of breeding values for udder health.

Why is milkability in connection with mastitis? One explanation can be seen when looking at the connections between milkability and leakage and connections between leakage and udder health. NAV is calculating breeding values also for leakage. The information comes from Finland where farmers are asked if a cow is leaking between milkings; leaking just before milking is ignored. Higher milkability is strongly

associated with increased leakage. This may be due to hormones and teat structure. Muscles that close the teat canal can be overly "relaxed". Due to this, milk flow is increased but also leakage can occur more frequent, and at the same time pathogens enter the udder more easily. Leaked milk also provides a good growing environment for bacteria.

When breeding for improved milkability one should be careful to select bulls that also have high breeding values for udder health at the same time. Otherwise the udder health level of the farm may decrease. The current economic weights in NTM will improve both udder health and milkability at the same time for our Nordic Holstein, RDC and Jersey populations. This can be seen when looking at the average breeding values in udder health and milkability of current top NTM bulls (Table 2). Again, NTM is a good tool to pick up the genetically superior animals and in improving all economically important traits at the same time.

Table 1. Correlations of EBVs of bulls born 2002-2006 and having official evaluation in NAV.

Holstein (1969 bulls)	scc	milkability	leakage	NTM
mastitis	0.76	-0.19	0.13	0.50
scc		-0.36	0.21	0.40
milkability			-0.29	0.09
leakage				0.06

RDC (1126 bulls)	scc	milkability	leakage	NTM
mastitis	0.73	-0.16	0.13	0.36
scc		-0.36	0.25	0.28
milkability			-0.44	0.19
leakage				-0.02

Jersey (258 bulls)	scc	milkability	leakage	NTM
mastitis	0.74	-0.12	-	0.55
scc		-0.26	-	0.48
milkability			-	0.06
leakage				-

Table 2. Average EBVs of top ranking bulls in NTM.

	HOL (NTM 25 or higher)	RDC (NTM 20 or higher)	JER (NTM 20 or higher)
mastitis	106.5	102.9	110.1
scc	107.6	100.4	107.8
milkability	104.0	106.4	100.3
leakage	100.3	98.3	-
NTM	27.1	22.7	22.7