Improved breeding values for udder conformation by including AMS data

Elisenda Rius-Vilarrasa and Emma Carlén (NAV/Växa Sverige), Anders Fogh (NAV/SEGES) and Terhi Vahlsten (NAV/Faba).

Improved NAV breeding values (EBVs) for udder conformation traits will be published in November 2016. Genetic evaluations for udder conformation traits have until now been based on a subjective linear classification system.

Large number of data – currently only Danish
Now, with a large number of dairy cows being milked using automatic milking systems (AMS) it is possible to use teat coordinates to obtain measures which resemble linear traits that were previously only registered by expert classifiers. This gives an increased number of observations especially in later lactations (Figure 1).
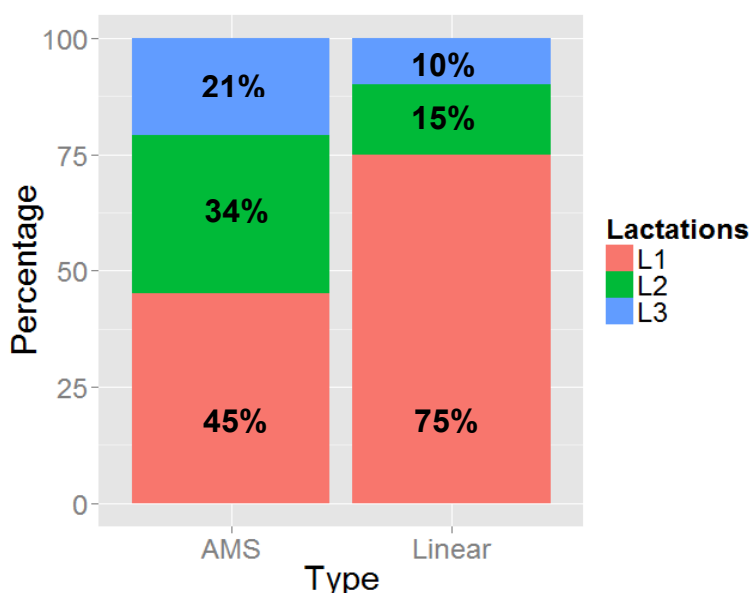

Figure 1. Percentage of udder records for lactations one to three from AMS and linear observations in Danish Holstein cows

Udder coordinates have been stored on the Danish data base since 2008, and the dataset include, up to November 2016, about 53.000 Holstein cows, 3.500 RDM cows and 3.800 Jersey cows with udder coordinates

AMS gives measures that resembles classified traits
Udder coordinates from AMS can be used to calculate alternative measures for teat placement front and rear, udder balance and udder depth. The AMS traits are within each lactation defined as the mean of all measurements from day 30 to 60 after calving. Table 1 shows that AMS traits have much higher heritability than classified traits. It also shows that genetic correlation between AMS measure and linear traits are very high – indicating that the 2 measures are describing the same trait.

Table 1. Genetic parameters (heritability and genetic correlations) for linear udder traits and AMS udder coordinates in first lactation cows.

Trait	Heritability Linear trait			Heritability AMS measure	Genetic correlation Linear-AMS
	HOL	RDC	Jersey	HOL,RDC, JER	HOL,RDC, JER
Teat Placement Front	0.32	0.27	0.27	0.61	0.91
Teat Placement Rear	0.28	0.26	0.26	0.48	0.93
Udder Balance	0.16	0.16	0.16	0.48	0.90
Udder Depth	0.39	0.34	0.34	0.67	0.97

AMS measures will therefore be included in the genetic evaluation for linear conformation traits, in addition to linear classifications, as correlated traits in the model. However, as previously, only breeding values for linear udder traits will be published.

Largest changes for cows
The effect of including AMS data is more information from second and third lactations which increases the reliability of EBVs. This is especially true for cows because the number of udder observations increases significantly in later lactations with the use of AMS coordinates. But also because AMS records are objective measures and based on many observations with a higher heritability than linear udder traits. For all these reasons, cows with AMS information can get much bigger changes in breeding values for udder than at an ordinary update. So far this is especially true for Danish cows since AMS data is currently only available from Denmark.
The effect on the bulls EBV is very limited since they already have high reliabilities for udder conformation. Only a few bulls having many daughters with AMS data change more than 2 EBV units.