

# Ano-genital distance as a Novel Reproductive Phenotype – an update

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Ano-genital distance (AGD) in female mammals is the distance from the anus to clitoris. Preliminary findings reported at this meeting in 2016 based on a 100 cow study reported poorer reproductive outcomes for cows with longer AGD than those with shorter AGD. Thus a larger study (n=921 cows) was designed to (1) characterize the distribution and variability of AGD, (2) determine the relationships among AGD, age and height, (3) estimate heritability of AGD, and (4) evaluate the associations between AGD and pregnancy to first artificial insemination (P/AI) and cumulative pregnancy by 250 days in milk (PRG250) in dairy cows (Journal of dairy science 2017, 100; 9815-9823). Overall, AGD had a normal distribution and high variability (mean [ $\pm$ SD]; 131.0  $\pm$  12.2 mm) and was weakly associated with cow age and height ( $r^2$  = 0.09 and 0.04, respectively). The estimated heritability for AGD was 0.52 ( $\pm$ 0.15). Ano-genital distance had an inverse relationship with P/AI in 1<sup>st</sup> and 2<sup>nd</sup> parity cows, but not in 3<sup>rd</sup> parity cows. Optimum threshold AGD that was predictive of P/AI was 127 mm in both 1<sup>st</sup> (Se=66% and Sp=56%) and 2<sup>nd</sup> (Se=46% and Sp=70%) parity cows. Accordingly, 1<sup>st</sup> and 2<sup>nd</sup> parity cows were categorized into either SHORT- or LONG-AGD ( $\leq$  or  $>$  127.1 mm; optimum AGD predictive of P/AI), and associations with reproductive outcomes evaluated. First parity cows with LONG-AGD had lower P/AI (31 vs. 54%) and decreased likelihood of PRG250 (80 vs. 87%) than those cows with SHORT-AGD. Similarly, second parity cows with LONG-AGD had reduced P/AI (28 vs. 44%) and a tendency for reduced PRG250 (74 vs. 82%) than cows with SHORT-AGD. Future studies should (1) validate these findings in diverse cow populations, (2) study the underlying physiological mechanisms that lead to reduced fertility in longer AGD cows, (3) investigate the genotypic and phenotypic correlations among AGD and other traits of interest, and (4) conduct genome wide association study to find out genetic markers associated with AGD in dairy cows.

Take Home Message: Ano-genital distance appears to be a promising novel fertility trait for genetic selection in dairy cattle. However, these findings need to be validated before it can be considered a fertility trait.