Holstein heifers with short anogenital distance conceive sooner and require fewer inseminations

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Why is this important?

Reproductive performance of dairy herds is an essential measure of healthy herds and successful dairy operations. Unfortunately, reproductive performance has declined over the past few decades, possibly as a result of selection for other traits. Recognizing this issue, scientists and geneticists have been working to improve reproductive performance through genetic selection. However, genetic progress in reproductive performance has been slow, emphasizing the need for novel phenotypes or indicator traits that complement current traits of economic importance (e.g. production / milk quality). Anogenital distance (AGD) is the distance from the centre of the anus to the base of the clitoris. In an initial study (presented in a separate DRECA Knowledge Summary), lactating 1st and 2nd parity Holstein cows with short (≤ 127 mm) AGD were found to be more fertile than those with long (> 127 mm) AGD.

The objective of this study was to determine if the same negative relationship exists between AGD and fertility measures in Holstein heifers, as the incorporation of newly discovered fertility traits, such as AGD, into selection indices are likely to bring significant benefits to the industry through advances in reproductive performance.

What did we do?

Using digital calipers, we measured AGD in 1,692 breeding-age heifers from 17 dairy herds in Alberta, BC and Washington State. The average age at AGD measurement was 13.9 ± 1.5 months, ranging from 10.8 to 20.2 months. Heifers were then categorized into short (≤ 110 mm) and long (> 110 mm) AGD groups based on the statistically-derived optimum AGD cut-point predictive of pregnancy to first artificial insemination (1st AI). Reproductive records were accessed through DairyComp305. The relationships between AGD group and fertility measures, i.e., services per conception, percent pregnant to 1st AI, age at conception, and cumulative pregnancy risk up to 15 months of age, were determined.

Figure 1. Measuring ano-genital distance (AGD); the distance from the centre of the anus to the base of the clitoris

What did we find?

The researchers found that anogenital distance was normally distributed and highly variable, where the overall mean AGD was 107.3 ± 10.5 mm (range, 69 to 142 mm). Only 6% of the observable difference in AGD could be explained by age at AGD measurement. Heifers with short AGD had greater pregnancy to 1st AI, fewer services per conception and conceived earlier than those with long AGD (**Table 1**).

Table 1. Relationship between anogenital distance (AGD) and various measures of fertility in maiden heifers of short- and long-AGD groups.

Description	Short-AGD (≤ 110 mm)	Long-AGD (> 110 mm)
Pregnant to 1st AI, %	58.3 ± 3.0	49.6 ± 3.1
Services per conception	1.5 ± 0.1	1.7 ± 0.1
Age at conception, d	448.4 ± 6.6	454.3 ± 6.7

A greater proportion ($P < 0.0001$) of long-AGD heifers remained open at 15 months (450 d) of age compared with short-AGD heifers (**Figure 2**).
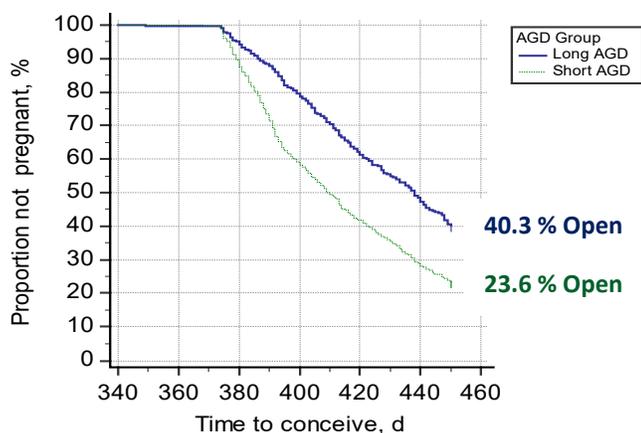
Figure 2. Proportion of heifers that remained nonpregnant up to 15 months of age.

What does it mean?

Heifers with superior fertility require less financial input during the rearing period and generate more economic gain during the first lactation period. For example, a 6-day reduction in age at conception for heifers with short AGD could result in rearing cost savings of up to $19.17 (CAD) per head, calculated at $3.19/d for a heifer weighing 360 kg at the time of conception. Considering that a significantly greater proportion of long-AGD heifers was nonpregnant at 15 months, there is potential to selectively remove long-AGD heifers that remain open beyond 15 months. This is one possible strategy to improve reproductive efficiency and profitability through reductions in rearing costs per head and improvements to herd productive life.

For more information, please see our recent publication in the Journal of Dairy Science: Carrelli, J.E., M. Gobikrushanth, M. Corpron, I. Rajesh, W. Sandberg, M.G. Colazo, A. Ahmadzadeh, M. Oba, and D.J. Ambrose. 2021. Relationship of anogenital distance with fertility in nulliparous Holstein heifers. J. Dairy Sci. 104:8256-8264. https://doi.org/10.3168/jds.2020-19940

Summary Points
- Heifers with short anogenital distance (AGD) have improved fertility compared with heifers with long AGD.
- Selective culling of long-AGD heifers that remain open beyond 15 months of age may be used as a strategy to reduce rearing costs.
- Results strengthen the potential for AGD to be used as a fertility phenotype in future selection programs and as a management tool.