

# Effects of pre- and post-weaning planes of nutrition on reproductive development of pre-pubertal Holstein heifers

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An early development of the reproductive tract and onset of puberty in heifers might benefit their future reproductive and productive performance. The objective of this preliminary study was to investigate how pre- and post-weaning planes of nutrition affect reproductive tract development and onset of puberty in Holstein heifers. Calves (n = 34) were randomly assigned to either Low (n = 18) or High (n = 16) pre-weaning diet (5 L/d or 10 L/d of pasteurized whole milk from 2 to 60 d of age), and then to either a Low (n = 18) or High (n = 16) post-weaning diet [30% straw, 70% Rumimax TMR (Optivia Rumimax, Nutreco, Guelph, ON) or 15% straw, 85% Rumimax TMR, from 3 to 6 mo of age], in a 2x2 factorial design. Starting at 6 mo of age, heifers were subjected to weekly ultrasonography of the ovaries (for follicular population) and uterus (for uterine thickness) until 7.5 mo of age, or until first ovulation (whichever occurred first). In a subset of heifers (n = 22) first ovulation was confirmed, determining onset of puberty. Body weight (mean  $\pm$  SE) at 6 mo differed (P < 0.01) between High (259  $\pm$  5.23 kg) and Low (239  $\pm$  4.68 kg) post-weaning diets, so body weight was accounted for subsequent analyses. The number of ovarian follicles  $\geq$  9 mm tended to be greater (P = 0.07) in heifers that received High (1.4  $\pm$  0.08) vs. Low (1.2  $\pm$  0.07) pre-weaning diets, and was significantly greater (P = 0.03) in heifers that received High pre- and High post-weaning diets (1.6  $\pm$  0.13) compared to those receiving Low pre- and High-post weaning diets (1.1  $\pm$  0.11). Regardless of pre-weaning diet, the largest follicle of heifers from High post-weaning diet was bigger (11.4  $\pm$  0.21 vs. 10.8  $\pm$  0.16 mm, P = 0.03), the uterus was thicker (12.0  $\pm$  0.24 vs. 10.4  $\pm$  0.18 mm, P < 0.001), and puberty was attained earlier (6.8  $\pm$  0.20 vs. 7.8  $\pm$  0.20 mo, P < 0.01) compared to heifers from the Low post-weaning dietary group.

**Take Home Messages:** Results indicate that increasing early-life-plane-of-nutrition benefits reproductive tract development and reduces time to puberty in Holstein heifers. However, such effects seem to be influenced only by post-weaning diet. Next steps of the current research are to investigate the effects of pre- and post-weaning planes of nutrition on growth metabolism, characteristics of estrous cycles, and subsequent performance.