

Impacts of pre- and post-weaning planes of nutrition on the uterus, ovaries and estrous cycle characteristics in Holstein heifers

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Our objectives were to investigate if differing planes of pre- and post-weaning nutrition had carryover effects on pre-pubertal reproductive tract development and post-pubertal estrous cycle characteristics in Holstein heifers. Heifer calves (n = 36) were randomly assigned to receive either a Low (5 L/d) or High (10 L/d of whole milk) pre-weaning diet (Pre-D) from 1 to 7 wk of age, and either a Low (70% concentrate dry TMR) or High (85% concentrate dry TMR) post-weaning diet (Post-D) from 11 to 25 wk of age. In the pre-pubertal phase, weekly transrectal ultrasonography was performed to assess thickness of the endometrium (inner layer of the uterus) and ovarian follicular numbers and size from 26 to 33 wk of age or until first confirmed ovulation. In the post-pubertal phase, ovaries were scanned weekly in a sub-set of heifers (n = 28) from 26 wk of age until at least the second ovulation was confirmed; thereafter, ovarian dynamics (through ultrasonography) and blood progesterone were assessed every 2 d through one complete estrous cycle. In the pre-pubertal phase, endometrial thickness (12.0 ± 0.4 vs. 10.8 ± 0.3 mm) and largest follicle size (11.8 ± 0.3 vs. 10.9 ± 0.2 mm) were greater in High Post-D heifers than in Low Post-D heifers. The number of medium size (6 to 9 mm) follicles was fewer in Low than in High Pre-D heifers (1.2 ± 0.1 vs. 1.6 ± 0.1), while the number of large (> 9 mm) follicles was fewer in Low than in High Post-D heifers (1.0 ± 0.1 vs. 1.2 ± 0.1). In the post-pubertal phase, characteristics of the estrous cycle (e.g. dynamics of corpus luteum and progesterone concentrations) did not differ among pre- and post-weaning diets. Compared to heifers of Low Post-D, heifers in High Post-D had greater number of total follicles (31.4 ± 2.2 vs. 21.4 ± 2.3) and tended to have more large follicles (3.6 ± 0.3 vs. 2.7 ± 0.3).

Take Home Message: Results indicate positive carryover effects of increasing the post-weaning plane of nutrition prior to 26 wk of age on the development of uterus and follicular growth in the pre-pubertal phase, and in the population of total ovarian follicles in the post-pubertal phase. Such findings suggest that increasing the plane of early life nutrition in heifers can have positive effects on future reproductive performance.