

High Nutrition During Early Life Improves Reproductive Potential In Holstein Bulls

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Holstein AI sires that reach puberty early and produce large numbers of normal sperm are highly desirable. The objective was to determine the effects of early-life nutrition on post-pubertal reproductive performance of dairy bull calves. Twenty-six bull calves were randomly allotted to 3 groups and fed approximately 70, 100, or 130% of NRC recommendations for both energy and protein from 2-31 wk; thereafter, all were all fed a 100% diet (adequate vitamins and minerals were always available). Growth rate, scrotal circumference, and paired testis volume were determined every 4 wk during the differential feeding period. Intensive blood sampling was done to characterize serum hormone concentrations. Once scrotal circumference reached 26 cm, semen collection was attempted (to confirm puberty). There were several significant differences between bulls on high- versus low-nutrition diets including: larger testes (~20%), younger at puberty (~45 d), an earlier rise in luteinizing hormone (LH), greater magnitude of LH secretion, an earlier increase in testosterone concentrations, and higher IGF-I concentrations throughout the differential feeding period. However, semen characteristics were not significantly different among all groups.

Currently, there is no consensus regarding how to manage young bulls prior to their arrival at AI centers. Based on the present study, underfeeding young bulls delayed puberty and reduced testis size, whereas better early-life nutrition resulted in earlier puberty, larger testes and potential for more sperm to be produced, with no significant reduction in semen quality, thereby hastening progeny testing and potentially increasing the number of insemination doses that could be produced. Based on previous work, there is no justification to continue high-nutrition beyond 31 wk. This research is expected to have widespread implications for the Canadian dairy and AI industries.