

Effect of Dietary Energy and Protein Density on Body Composition in Dairy Heifers during the Peripubertal Period

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Rapid prepubertal growth rates hasten the onset of puberty but have a detrimental effect on mammary development and milk production potential of dairy heifers. Despite evidence relating mammary development to reproductive maturity, and the effects of nutrition on mammary development, there are no studies documenting the effects of diet on body composition in dairy heifers during the pre or peripubertal period.

Our objectives were to examine the effects of dietary energy and protein density on age and body composition at puberty in Holstein heifers. In phase 1, heifers were randomly allotted (n=10/diet) at 100 kg body weight (BW) to diets with either Low (P1L), Medium (P1M) or High (P1H) energy and protein for an average daily gain (ADG) of 0.5, 0.8 or 1.1 kg/d, respectively. During phase-2 (P2), all heifers were fed *ad libitum* a common diet formulated for an ADG of 0.8 kg/d. Half the animals within the high (n=5) and low groups (n=5) entered P2 either at 12 mo of age (P2H-12; P2L-12) or at 330 kg BW (P2H-330; P2L-330). Heifers fed P1H, P1M, P1L and P2L-12 diets attained puberty at approximately 9, 11, 16 and 14 mo of age, respectively (P<0.01). Urea space estimates of body fat and protein percent, and back-fat thickness, were lower in P1L heifers compared to P1H or P1M heifers at similar chronological age (P<0.05) but did not differ at puberty (P>0.10).

Implications: Dairy heifers attain puberty at a constant body weight and body composition independent of dietary manipulation. This information could be useful for formulating diets that hasten the onset of puberty and reduce the time to first conception, without compromising on productive potential of dairy heifers.