

The effect of age and liveweight at first calving on the shape of the lactation curve of dairy heifers

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Variation in milk production during lactation is commonly described as a lactation curve. The production by dairy cows typically increases with time until a peak is reached at 4 to 8 weeks after calving and then steadily declines until lactation ceases. The combined effects of age (AFC) and liveweight at first calving (LWFC) on the yield and composition of milk in the subsequent first lactation have been reported by Dobos *et al.* (2001). However, it is not known how these two factors affect the shape of the lactation curve.

Weekly milk yields during the first 12 weeks of first lactation from dairy heifers grown to achieve different AFC and LWFC were used to determine if AFC and LWFC affected the shape of the lactation curve. Data from 111 heifers were used. Empirical (linear or non-linear), mechanistic or non-parametric models fitted to the data have been used to study the curve of dairy cows. We chose to use the method of Verbyla *et al.* (1999). Briefly, a mixed model for the response of milk yield to time and treatment group was fitted. Fixed terms in the model were main effects of AFC, LWFC and time (weeks) as well as all their interactions. That is, a linear model relating milk yield to time with intercepts and slopes was allowed to vary according to treatment group. Curvature in the response was incorporated by inclusion of a cubic spline term for time as a random effect. Lack of fit was also included in the model as random deviations due to time increments. Model fitting was accomplished using ASREML (Gilmour *et al.* 1999).

The analysis indicated significant ($P < 0.05$) effects of AFC and LWFC on milk yield but there was no interaction. A linear response over time was found to depend on AFC, while curvature about that response was dependent on LWFC. Neither AFC nor LWFC effected the overall shape of the lactation curve. However, the position of the curve differed depending on treatment (see Figure 1). Within each treatment the gain in production from 550 to 620 kg was small. This suggests an optimum LWFC that is between 550 and 620 kg. The optimum LWFC for milk yield was reported by Dobos *et al.* (2001) to be 559 kg.

Dairy managers will now be able to implement feeding strategies during early lactation to account for AFC and LWFC of dairy heifers.

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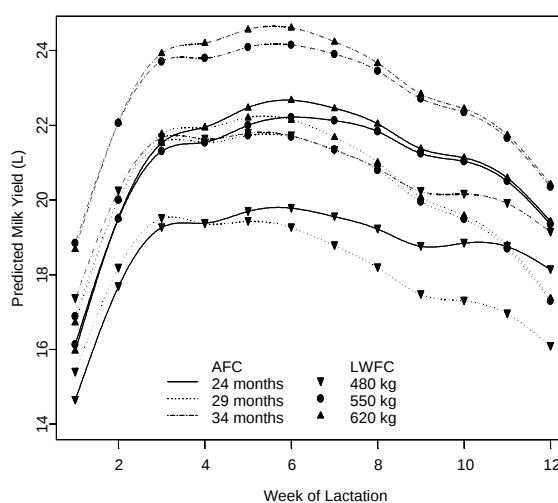


Figure 1 Lactation curves for first 12 weeks of first lactation.