SEASONAL VARIATION IN CASEIN FRACTIONS IN TWO DAIRY FEEDING SYSTEMS

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The composition of protein in milk from commercial farms varies with season (A. Houlihan *et al.* pers. comm.) and this is important because it changes the quality of raw milk, and the way it is processed. This study examined how the composition of milk casein varies over a whole lactation. It was anticipated that the factors causing variation may include environment, nutrition, management and seasonal effects.

Milk samples were collected from spring-calved cows in 2 feeding systems at the Department of Primary Industries and Fisheries Mutdapilly Research Station. The first was a dryland, tropical pasture-based system, designated M1 and the second a. lot-fed, high quality, consistent input system, designated M5. Milk samples were collected from the cows at 10, 20, 35, 50, 70, 100, 130, 160, 190, 220, 250, 280 days of lactation (DIM) ± 4 days. Samples were analysed for milk protein composition by HPLC.

The 2 feeding systems differed substantially in the plane of nutrition (e.g. average daily ME intake for M1 was 188 MJ/day, compared with 225 MJ/day for M5). Despite these differences, the proportions of the casein fraction within milk casein varied similarly over the duration of the experiment (Figure 1). There were no significant differences between the 2 herds for the proportions of the β-, κ- and α_{s2}-caseins. κ- and α_{s2}-caseins in the 2 feeding systems, in fact, were very highly correlated (R^2=0.92, P<0.05 and R^2= 0.75, P<0.05, respectively). The profile of α_{s1}-casein in the2 herds followed a significantly different, but parallel pattern of variation.

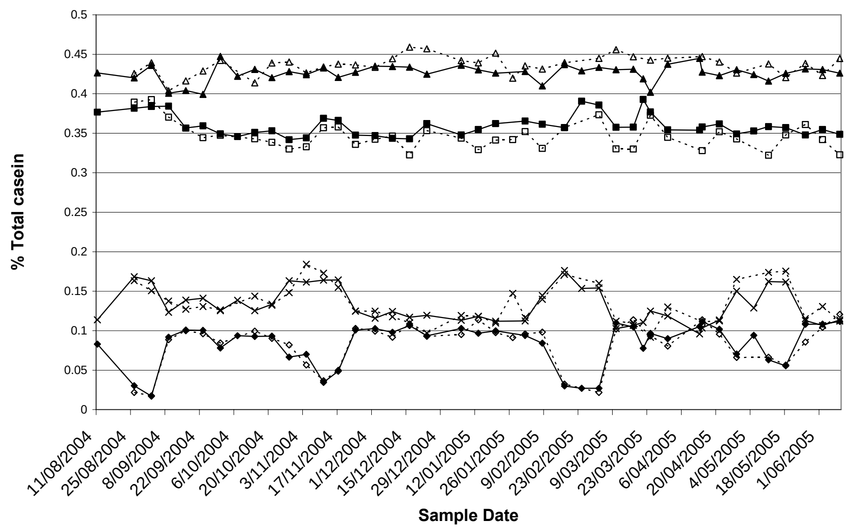

Figure 1: The proportion of casein fractions in milk casein over time (M1: solid line, M5: dashed line; Δ β-casein, ◊ κ-casein, □ α_{s1}-casein, x α_{s2}-casein)

At several different times during the experiment, large and rapid changes in the casein profile were observed. During short periods in November 2004, February 2005 and May 2005, the proportion of κ-casein fell by between 35 and 65% before returning to original levels, over approximately 4 weeks. α_{s2}-Casein varied similarly, albeit inversely, at the same time. Neither α_{s1}- nor β-casein, nor total casein content of milk changed significantly during these episodes, or at other times during the experiment. Both herds experienced the same fluctuations. The fact that this trend is evident across both herds indicates that this is not purely a nutritional effect, and is most likely either directly or indirectly related to environmental factors.

D.G. Barber (pers. comm.) found that the main factor affecting on-farm composite milk κ-casein proportion is maximum temperature and that affecting α_{s2} proportion is average daily radiation. In this study, the point where changes in the profile are initiated was often preceded by high ambient temperatures, but such changes were not seen during all periods of hot conditions. High temperatures affect dairy cows by reducing the quality of pasture-based diets (increased NDF content and decreased digestibility), and by adversely affecting the intake and rumen health. These preliminary results indicate that the effect of temperature, change in maximum temperature and time for recovery on milk casein fractions are worth investigating further.

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