

Diet preference response of dry cows to rumen propionic acid concentration

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When an animal learns about a food it integrates information on sensory attributes, and postingestive effects unique to each food. These postingestive effects may be pleasant or unpleasant to the animal, and thus influence food preferences and future diet selections. Propionic acid (PA), which is produced in the rumen, is a major energy precursor in ruminants and has been shown to affect food preferences in sheep (Villalba and Provenza 1996). The aim of this study was to test the hypothesis that cows are sensitive to changes in rumen PA concentration at physiological levels, which they will express through preferences for diets distinguished by flavour only.

Sixteen non-lactating, rumen fistulated cows were fed a maintenance ration of chaff flavoured with either anise or vanilla over 6 hours each day. Following an 8 day flavour familiarisation period, and initial flavour preference test, cows were allocated to one of four treatments: 0, 5, 10 or 15% of daily maintenance ME requirements supplied by a 3 hour intraruminal infusion of propionic acid. For a 10 day period, cows received an infusion on odd days in combination with a specific flavour (termed infusion flavour) and no infusion on even days in combination with the alternative flavour. On the final day, each cow was offered both flavours simultaneously for 20 min. Preference for the flavour associated with the infusion was calculated as the cows' final preference for the infusion flavour (% of total DM intake) minus the initial preference for that same flavour.

Mean rumen fluid PA concentration (measured during and 3 hours post infusion) was significantly correlated with treatment ($r^2 = 0.92$, Fig 1), but had no significant effect on preferences ($P > 0.05$) due to a wide range of responses within each treatment. This variation between cows was related to condition score ($P = 0.057$, $r^2 = 0.23$, Fig 2), liveweight ($P = 0.042$, $r^2 = 0.26$) and number of dry days prior to the experiment ($P = 0.016$, $r^2 = 0.35$). Lighter cows generally preferred the infusion flavour, and heavy cows the alternative flavour, suggesting that cows in poor condition were attempting to replenish body energy reserves and cows in better condition were avoiding excess fattening. Although

there were no dose-related responses to PA infusion, results indicate that cows are sensitive to, and can discriminate between feeds based on anticipated rumen PA concentration, and that food preference is greatly influenced by physiological state.

Villalba, J.J. and Provenza, F.D. (1996). Preference for flavoured wheat straw by lambs conditioned with intraruminal administrations of sodium propionate. *Journal of Animal Science* 74, 2362–2368.

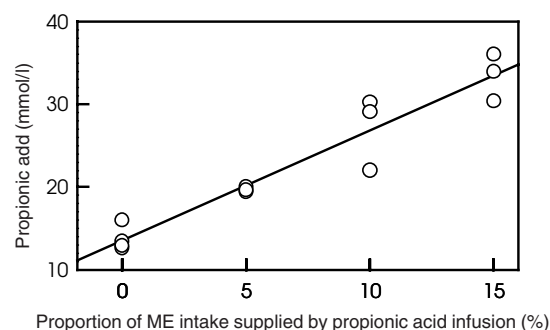


Figure 1 The relationship between treatment (proportion of daily ME intake supplied by propionic acid infusion, %) and rumen fluid propionic acid concentration.

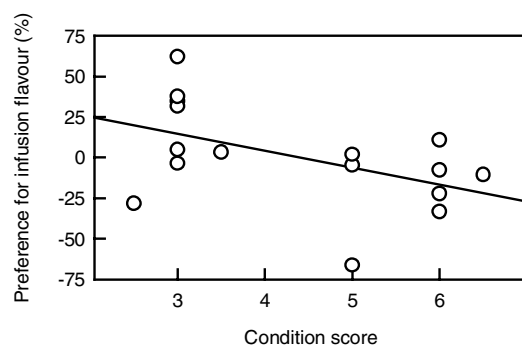


Figure 2 The relationship between condition score and preference for the flavour associated with propionic acid infusion.