Evaluation of by-product feedstuffs: acceptability to cattle and farm feeding procedures

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ABSTRACT

Groups of 6 animals were exposed to 1 of 8 by-product feedstuffs for 15 minutes daily. Each animal's consuming time was scored. Stable intakes occurred after intervals ranging from 2.3 d for whey permeate to 6.4 d for brewer's waste. Sulphuric acid whey and mother liquor were not accepted. Familiarising the animals with the pens and feeding procedures, and reducing social dominance effects resulted in increased consumption.

Mixing a low preference feed in increasing proportions with a highly acceptable feed can result in cows eating previously rejected products. By this means cows were changed from concentrated deproteinised lucerne juice or corn steep liquor (highly acceptable) to mother liquor, brewer's waste or cheese whey (less acceptable) in from 5 to 15 days.

Keywords Acceptability; casein whey; mother liquor; cane molasses; brewer's waste; deproteinised lucerne juice; corn steep liquor; cheese whey

INTRODUCTION

The administration of prophylactics for control of bloat, facial eczema or magnesium deficiency in dairy cattle will maintain high production and minimise animal losses. Drenching is a reliable procedure for ensuring that medicaments are taken though less than 50% of Waikato farmers use this technique for bloat control (ICI Tasman, 1980). Drenching is inconvenient in rotary parlours.

An ideal treatment method would be achieved if cows self-administered a precise medicament dose during the milking period. This may require the use of a palatable carrier to mix with and mask less palatable medicaments. Liquid molasses is an acceptable carrier for teric detergents (Stockdale and Patterson, 1981). Identifying cheaper and more-readily available substrates for use in New Zealand would seem desirable.

METHODS AND RESULTS

Eight groups, each of 6 randomly selected heifers, 6 or 18 mo of age and which were normally grazed on ryegrass/white clover pasture were used in the study. Two troughs (1.5 x 0.45 m) were supported lengthwise at a height of 0.5 m in each of two 6 m x 3 m pens. Two wooden partitions (40 x 50 cm) divided each trough into 3 equal parts to restrict cow dominance interactions.

In experiments 1 and 2, 5 l of by-product were placed in each trough before each daily test session of 15 min. Two groups were observed simultaneously. Two observers for each group recorded responses of sniffing, licking and drinking for each individual during consecutive 30 sec intervals.

By-products Tested

Seven by-products were tested: casein whey (3 types — sulphuric acid whey (SW); lactic acid whey (LW) and deproteinised concentrated rennet whey (permeate -WP)); delactosed concentrated cheese whey (mother liquor -ML); sugar cane molasses (Mo); concentrated deproteinised lucerne juice (CDLJ); brewer's waste (BW); corn steep liquor (SL) and cheese whey (CW).

Experiment 1. Acceptability of By-products

Eight groups of naive animals (6 mo) deprived of pasture for 16 h were exposed to 1 by-product to determine its acceptability and intake pattern. Daily tests were conducted for 10 to 19 d and were terminated when consuming time was stable for 5 consecutive days.

Results

The number in each group consuming at the time of stability, the number of days to reach stable peak

intakes, and the time spent licking or drinking each of 8 by-products are shown in Fig. 1.

The typical pattern began with sniffing, then further investigation and with tentative licking following. Accepted feeds were consumed in increasing quantities over 2 to 7 d before a plateau was reached. Eight to 11 minutes were spent consuming the more acceptable by-products at stability. Based on the number of animals licking, LW was consumed for longer periods than WP, but equivalent times were spent consuming the remaining feeds (Kruskal-Wallis test). No cows ate ML or SW, while all 6 animals ate SL, CDLJ and Mo. It was concluded that SL, CDLJ and Mo are likely to have value as carrier feeds.

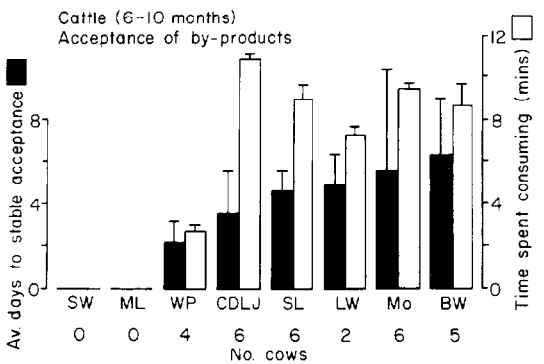

FIG. 1 Number of animals in each group consuming, the mean (± 1 s.e.) of the times spent consuming (licking and drinking) and the number of days to stable performance in groups of 6 heifers exposed to 8 different by-products.

Experiment 2. Effects of Age, Deprivation, Dominance and Familiarity

Firstly, groups of 18 mo old heifers were given access to SL, Mo, WP or ML after 16 h food deprivation. Then, 3 of these groups, (WP, Mo and SL) and 3 groups of 6 mo old heifers (BW, LW, CDLJ) were tested after direct removal from pasture (0 h deprivation). Finally the heifers in the SL group were ranked for social dominance status. Acceptance of the feed by the 3 low dominance animals was examined in the presence and absence of the 3 high dominance members.

Results

The acceptance (number consuming, days to stable acceptance, time spent consuming) of each by-product by 18 mo animals and 6 mo animals was not significantly different. The number of animals and the times spent consuming each feedstuff at the 2 levels of deprivation were similar (Wilcoxon matched pairs test). Subordinate heifers spent less time eating in the presence of the dominants than in their absence (6.2 *v* 7.4 min; 4.7 *v* 7.9 min; 6.7 *v* 9.0 min).

Groups of 6 mo old cattle with no prior experience of the experimental routines took 4.5 (± 0.8) d to reach peak uptake on SL, while a group already familiar with the pens, trough and experimental routines but not with SL required only 1.8 (± 1.0) d to reach peak intake.

Experiment 3. Mixing Feeds to Gain Acceptability

No cows tested would consume ML, although consumption of ML by milking cows is commonplace on Taranaki farms. Early experience of ML (at weaning) may be required. Acceptance of unpalatable feeds by inexperienced older animals may be facilitated by mixing the feeds with preferred items. This experiment tested whether the acceptance of a non-eaten feed (ML), a low-preferred feed (CW) or a moderately-preferred feed (BW) by naive cows was facilitated by mixing them in increasing proportions with a highly acceptable feed such as CDLJ or SL.

Groups of 6 yearlings already familiar with CDLJ or SL were used. One of the unpalatable feeds was mixed with either CDLJ or SL according to 2 procedures (a) the proportion of the unacceptable feed in the mix was increased rapidly from 0 to 100% over 5 d provided that intake was maintained at each mixture level; or, (b) the unpalatable proportion was increased by smaller steps, e.g. SL mixed with CW.

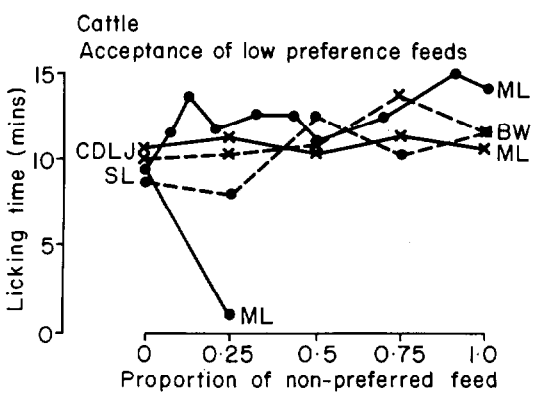

FIG. 2 Time spent consuming mother liquor (ML) and brewer's waste (BW), unpalatable by-products, when they were mixed in rapidly or slowly increasing proportions with either of 2 palatable feeds (CDLJ or SL) by groups of 12 mo old heifers.

Results

Figure 2 shows that all cows consumed mixtures of BW/CDLJ, ML/CDLJ and BW/SL and accepted pure BW or ML in 5 d. However, after 3 d of 25%

ML mixed in SL, consumption dropped to nil. When the proportion of ML in SL was increased more slowly the acceptance of ML was maintained. The subsequent time spent consuming pure ML was equivalent to or higher than that of the original palatable base feed.

When unpalatable cheese whey (CW) was mixed in slowly increasing proportions with SL and CDLJ (Figure 3) acceptance was maintained at all levels up to but not at 100% CW. Shortage of whey prevented tests to determine whether 100% CW would be accepted by cattle.

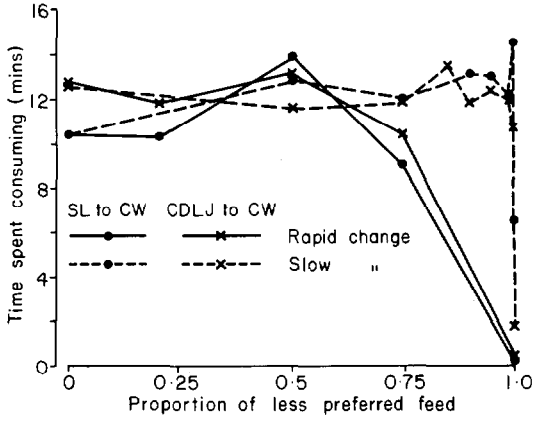

FIG. 3 Time spent by groups of 12 mo old heifers consuming cheese whey (unpalatable) mixed in rapidly or slowly increasing proportions with either CDLJ or SL.

DISCUSSION

CDLJ, SL, Mo are preferred and could be useful carriers for animal remedies on the basis of time to stable acceptance, percentage of animals consuming and proportion of available time spent eating. There was no significant correlation between average number of days to stable performance and the times spent consuming the 6 accepted feeds at stability ($r_s = 0.52$ NS). Once eating began, the time spent consuming was relatively uniform across feeds. This suggested that initially rejected items can become useful and acceptable feedstuffs for cattle once intake begins.

Being familiar with troughs and yards assisted feed acceptance as did reduced social reactions. It was not necessary to withhold cows from pasture to ensure acceptance.

Some adult cattle refused to consume some feeds e.g. ML and SW. Typically, they withdrew after a brief sniff and never started licking. Introducing ML to calves around weaning time may ensure adult acceptance of ML. An alternative approach used with mature animals (Welch *et al.*, 1974) was systematically investigated in Experiment 3 where low preference materials (ML, BW and CW) were added in increasing proportions to an accepted feed. Acceptable feeds which have distinctive odours, colours or taste (e.g. CDLJ) can help mask the added material. Although CDLJ and SL were equally acceptable, ML was consumed readily after 5 d of mixing with CDLJ but not SL. BW, a moderately preferred item, was accepted after mixing with both CDLJ and SL. Some previously rejected feeds (e.g. ML) become as or more acceptable than the initial, preferred base items. When using the mixing techniques Stockdale and Patterson (1981), Frye *et al.* (1977) and Marten (1978) have demonstrated the value of adding palatable agents such as molasses to unpalatable feeds to ensure acceptance. Introducing animals either by early exposure (Keogh and Lynch, 1982) or by mixing acceptable and unacceptable feeds provides a practical method to exploit by-products often considered unacceptable to cattle. Further, these items could possibly act as low-cost carriers for animal remedies.

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