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## RUMINAL ADAPTATION TO INCREASING LEVELS OF CONCENTRATES

A.M. VAN VUUREN, G. HEMKE and S. TAMMINGA

*Research Institute for Livestock Feeding and Nutrition, Lelystad, the Netherlands*

Dairy cows, even if in good condition, are often fed concentrates during late pregnancy. This is then assumed to result in a better adaptation of the rumen microbes to the high-concentrate rations required in early lactation. Haalstra and Malestein (1977) concluded, however, that this feeding strategy will increase the risk of digestive disorders in early lactation. They also stated that excessive concentrate feeding during late pregnancy does not improve adaptation and is therefore unnecessary.

The question which then remains is how quickly after parturition can the concentrate intake of dairy cows be increased without causing digestive problems ?

### Experimental procedure.

Two rumen-fistulated cows received long meadow hay (10 kg per day) for at least three weeks. Throughout the experiment, hay and concentrates were spread over two equal meals, offered at 07.00 and 16.00 h. Two days before and during each experimental period, the amount of hay was restricted to 6 kg per day. On the third day (D3) of the experimental period, concentrates (22.5 % tapioca, 25.0 % maizegluten feed, 3.4 % molasses, 15 % soybean meal, 12.1 % wheat, 7.0 % citrus pulp, 1.0 % lard, 7.0 % sugarbeet pulp, 3.3 % oat husk meal, 2.0 % coconut expeller and 2.0 % minerals and vitamins) were offered for the

first time. In period I, 1 kg of concentrates was offered on D3 and the amount was increased by 1 kg per day. In period II, 4 kg of concentrates were offered on D3 ; between D4 and D7 the amount was increased by 1 kg per day and from then on by 0.5 kg per day. In period III, 4 kg of concentrates were offered on D3 and the amount was increased by 2 kg per day. The experimental periods, during which daily feed refusals were weighed, ended when these refusals exceeded the extra amount of concentrates offered. Between periods, the animals received long hay for at least three weeks (10 kg per day).

In the experimental periods, samples of rumen fluid were taken after each meal. The pH was measured 1, 1.5, 2, 3 and 5 hours after feeding. 5 ml samples for VFA and NH<sub>3</sub> analyses were taken 1, 2 and 5 hours after feeding ; and also for lactate analyses 1, 1.5, 2 and 3 hours after feeding ; all samples were preserved and stored at 4° C. Ammonia was determined colorimetrically. VFA and lactate were analyzed by gas liquid-chromatography. The rate of lactate fermentation was measured by incubation of 10 ml rumen fluid (taken at 14.00 h) with 1 ml of a 0.4 M L-lactate solution at 39°C under CO<sub>2</sub>. Samples were taken after 0, 2 and 4 hours and L-lactate was analyzed enzymatically.

### Results and Discussion.

Maximum DM-intake was achieved in

period II, in which the intake above 8 kg of concentrates was increased most gradually (table 1). In period III, when the intake of concentrates increased most rapidly, rumen pH and lactate concentrations were less extreme, maximal DM-intake however was the lowest.

High rumen acidity as a reason for refusing food seems therefore unlikely in this period, which correlates with the results of Tremere *et al.* (1968).

In all three periods, total concentrations of

VFA increased, and pH decreased with increasing concentrate intake, but no significant differences were found between the three methods of concentrate increment (fig. 1 and 2). If adaptation occurs one should expect an increase of lactate and a higher rate of L-lactate fermentation. The absence of this effect in period III (fig. 2) suggests no adaptation of protozoa (Mackie *et al.*, 1978) and/or bacteria to the fast increment of concentrate feeding. This could have led to a stasis of food in the rumen, thus inhibiting food

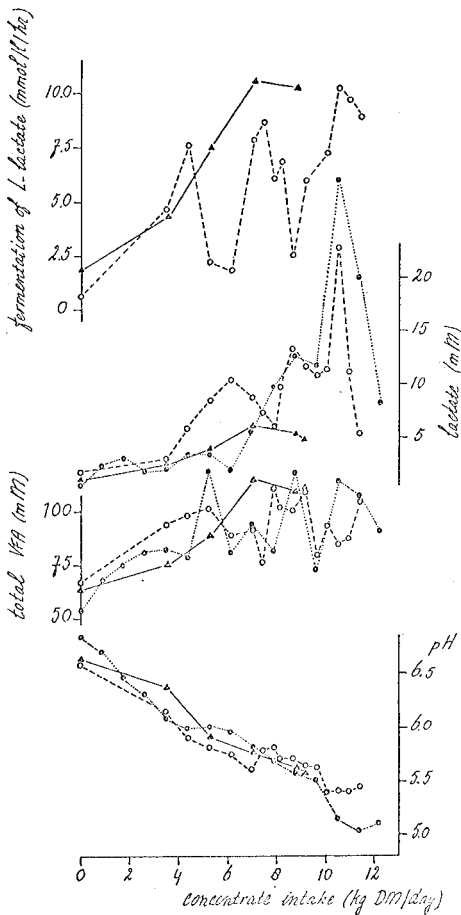


Fig. 1. — Daily mean of ruminal pH, the concentrations of volatile fatty acids and lactate and the rate of fermentation of L-lactate of cow 1. (● - - - ● period I; ○ - - - ○ period II; ▲ - - - ▲ period III).

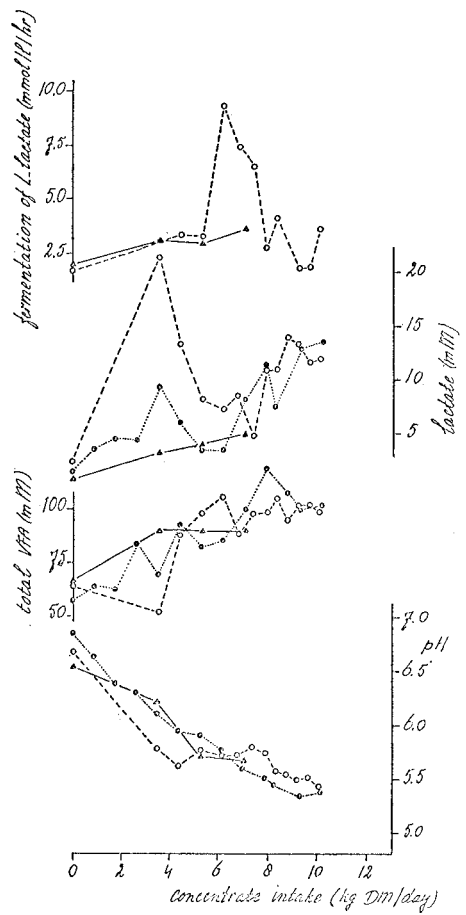


Fig. 2. — Daily mean of ruminal pH, the concentrations of volatile fatty acids and lactate and the rate of fermentation of L-lactate of cow 2. (● - - - ● period I; ○ - - - ○ period II; ▲ - - - ▲ period III).

intake. The very fast increase of the rate of L-lactate fermentation in cow 1 in period III does suggest important differences between animals. Although cow 2 received the same amount of concentrates (4 kg) on D3 in period

II and III, the effect on lactate and VFA concentrations was different. This supports the result of Rémond and Journet (1972), who found important variation from one day to another with the same treatment.

Table 1. — Extreme values of daily dry matter intake, mean ruminal pH, and concentration of lactate.

	Period	Maximal DM intake (kg/day)	Minimal pH	Maximal lactate conc. (mM)
Cow 1	I	15.2 (11.4) <sup>1</sup>	5.05 (11.4) <sup>1</sup>	29.1 (10.5) <sup>1</sup>
	II	16.2 (11.4)	5.40 (10.1)	22.8 (10.5)
	III	13.8 ( 8.8)	5.58 ( 9.1)	4.9 ( 7.0)
Cow 2	I	15.1 (10.2)	5.34 ( 9.3)	13.6 (10.2)
	II	15.2 (10.1)	5.42 (10.1)	21.4 ( 3.5)
	III	12.1 ( 7.0)	5.67 ( 7.0)	5.0 ( 7.0)

<sup>1</sup> Intake of concentrates (kg DM) on the day the mentioned parameter was measured is written in parentheses.

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