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Effects on milk yield and composition of infusions of graded levels of glucose into the duodenum of dairy cows

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Increased glucose or propionic acid availability may decrease milk fat content according to the glucogenic theory but it does not affect milk protein yield (Hurtaud *et al.*, 1993). The objective of our experiment was the establishment of a law of response of protein content/fat content ratio to postprandial glucose supply.

Three continuous duodenal infusions of glucose (500, 750 or 1 500 g/d) were compared with water as control. Four ruminally and duodenally fistulated Holstein cows (7 weeks in lactation) were used in a 4 x 4 latin square (2 weeks/period). The basal diet (51.2% maize silage, 16.3% dehydrated alfalfa, 25.1% energy concentrate and 7.4% soybean meal) was fed proportionally to the energy infused so that energy and nitrogen needs were met. The composition of energy concentrate was 15% wheat, 15% corn, 15% barley, 20% wheat bran, 25% sugar beet pulp, 1% fat, 5% molasses and 4% mineral salts. Milk fat and protein contents were measured every day and blood was sampled 1 h before morning feeding on the last day of each period.

Increasing levels of glucose did not affect milk yield but decreased milk fat yield and content ($P < 0.05$) and tended to increase milk protein yield and content. Milk casein also tended to

increase (table I). Infusing 750 g/d of glucose seemed to result in minimum fat content and yield. By contrast, the maximum protein yield and content could have been higher with an infusion level exceeding 1 500 g/d glucose. With an increased level of glucose infusion, 3-hydroxybutyrate and non-esterified fatty acids contents were decreased ($P < 0.05$) while glucose and insulin levels remained the same.

Glucose infusion gave classical results, *ie* a large decrease in fat yield and content and no change in protein yield. These results confirm the lack of response of protein yield with either iso-energetic infusions of glucose or VFA (Hurtaud *et al.*, 1993). The highest protein content/fat content ratio seemed to be obtained after addition of 750 g/d glucose. Future studies using longer periods of glucose infusion (> 2 weeks) are required to confirm these results especially for protein content (Rook and Balch, 1961) and to identify metabolic changes.

Hurtaud C, Rulquin H, Vérité R (1993) *J Dairy Sci* 76, 3011-3020

Rook JAF, Balch CC (1961) *Br J Nutr* 15, 361-369

Table I. Effect of different levels of glucose on milk yield and composition.

Glucose infusion (g/d)	0	500	750	1 500	SE
Energy intake (MJ NEL)	130.9	137.8	135.4	145.0	9.0
Milk yield (kg)	38.0	38.2	37.5	37.8	1.0
Fat (g/kg)	40.9 ^a	37.1 ^b	35.4 ^c	34.8 ^c	0.7
Protein (g/kg)	28.0	28.0	28.4	28.8	0.7
Casein (g/kg)	22.7	23.1	23.3	23.6	0.7

a, b Within-line means with different subscripts differ ($P < 0.05$).