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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 postruminal 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 isoenergetic 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.

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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 ($P < 0.05$).