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Feeding corn and barley based concentrates to grazing dairy cows. II. Plasma glucose and insulin concentrations after glucose challenge

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Protein and energy availabilities in the rumen may be umpaired in cows fed autumn-winter forages and a risk of ammonia toxicity may develop. Hyperglycaemia and reduced insulin release were reported in hyperammonemic diets (Fernández *et al*, 1988, J Anim Sci, 66, 3259-3266 ; Visek, 1984, J Dairy Sci ,67, 481-498).

Animals and treatments have been described by Gagliostro *et al* (1995, this issue). In week 4, jugular blood samples were taken before (G-0), and 5 (G-5), 10 (G-10) and 15 (G-15) minutes after an intravenous glucose challenge (100 mg/kg body weight) .Fractional rate of glucose clearance (k) was calculated as the slope of the regression of time on lnC where C = glucose concentration at times 5, 10 and 15 minus G-0 glucose concentration. In week 1, jugular (J) and mammary (M) blood samples were taken to evaluate apparent mammary uptake of metabolites. Plasma was analysed for urea, glucose, triglycerides (TG) and free fatty acids (FFA) using enzymatics kits. Plasma insulin was determined by radioimmunoassay. Data were analysed using a split-plot design with treatment as main plot and sampling time as secondary plot.

Basal (G-0) glucose concentrations were 69.3, 69.2 and 72.3 mg/dl for PA, CO and BA. Glucose concentration in G-5, G-10 and G-15 samples were higher than G-0 ($P<0.05$) but similar between treatments. Averaged values from all treatments showed increases in glucose concentration of 48.8, 38.7 and 31.4 mg/dl in G-5, G-10 and G-15 respect to G-0 ($P<0.05$). Glucose concentration inmediately after the injection (131.9, 130.7 and 141.9 mg/dl), distribution volume (40.22, 41.56 and 40.33 l) and k values (-0.041, -0.045 and -0.059) were similar in PA, CO and BA. Decreases in FFA after glucose challenge did not differ between treatments ($P<0.60$). Averaged values from all treatments showed lower ($P<0.05$) values in G-5 (334 µEq/l), G-10 (327 µEq/l) and G-15 (289 µEq/l) respect to G-0 (418 µEq/l). Plasma urea was higher ($P<0.05$) at G-10 (17.84 mg/dl) and G-15 (17.73 mg/dl) respect to G-0 (16.06 mg/dl). Basal (G-0) plasma insulin was higher in BA respect to CO. Insulin release after glucose injection was similar between treatments ($P<0.11$). Surface under the insulin curve tended to be lower ($P<0.09$) in CO (304 µU/min) respect to PA (417 µU/min) and BA (469 µU/min). Insulin k values tended to be lower in PA (-0.02794) respect to CO (-0.04566) and BA (-0.05848). J-M differences were similar between treatments ($P>0.10$). Significative apparent mammary uptake were observed for glucose, TG and FFA but not for urea.

Glucose metabolism and insulin release after glucose challenge did not differ between unsupplemented cows exposed to higher ammonia absorption and cows receiving concentrates with different rumen starch degradability.

	PA	CO	BA	Mean
Insulin (µU/ml)				
G-0	6.68^{ab}	5.68^{a}	10.34^{b}	7.57^{c}
G-5	33.29	25.59	37.93	32.27^{d}
G-10	34.46	23.29	37.48	31.74^{d}
G-15	27.17	18.39	26.36	23.97^{e}
Mean	25.40	18.24	28.03	

$^{a, b}$: within line means with different letter differ ($P<0.05$)
$^{c, d, e}$: within column means with different letter differ ($P<0.05$). Treatment x sampling hour was not significative