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Effect of starch supplementation and maturity of grass silage on nutrient fluxes in splanchnic tissue of dairy cows

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High amounts of starch in grass silage based diets for dairy cows negatively influenced OM and NDF digestibility, reduced acetic/propionic acid ratio in rumen fluid, and increased microbial protein yield (Van Vuuren *et al*, Proc Soc Nutr Physiol, 1995, 4).

In a 4 x 6 cyclic-change-over design (4 periods, 6 dairy cows) net nutrient fluxes in splanchnic viscera of dairy cows were quantified. Cows received totally mixed rations, containing grass silage, (63 % DM), pressed beet pulp (14 % DM) and starch-free concentrates (23 % DM). Treatments were silage of "young" (YS) or "mature" grass (MS) and starch supplementation (0, 2 or 4 kg flaked maize/day). Cows were equipped with a rumen cannula and indwelling catheters in portal, hepatic, and mesenteric veins, and in a mesenteric artery. Portal and total splanchnic blood flow were measured, using para-amino-hippuric acid (PAH) as a marker. After a 3-week adaptation period, blood samples were taken from portal, and hepatic vein, and mesenteric artery and plasma analyzed for PAH, ammonia, urea, glucose, VFA, β-hydroxybutyrate and lactate. Net fluxes were estimated for portal-drained Viscera (PDV), Total Splanchnic Viscera (TSV) and Liver (L). An ANOVA with cows and periods as blocks and silage maturity, starch supplementation, and their interaction as treatments.

Blood flows were similar and were 1773 ± 78 l/h and 2122 ± 103 l/h for PDV and TSV, respectively. Partly, the results of the experiment are given. Both maturity and level of starch significantly reduced net ammonia release from PDV and urea synthesis in liver. Glucose synthesis in the liver was similar for all treatments. The major glucose precursors are given in Table. Total VFA release by PDV correlated highly (R^2 = 0.85) with rumen fermentable OM as calculated in the Dutch Protein System, when the measured decreases in digestibility of OM and NDF were taken into account (Van Vuuren *et al*, 1995).

In conclusion, maturity of grass silage and supplementation with starch reduced net ammonia release in PDV. Glucose synthesis in the liver depended for ca 25 % of gluconeogenesis from amino acids.

	Silage		Starch		
	YS	MS	0	2	4
DM intake (kg)	17.6	17.5	16.6	17.5	18.6
Ammonia-N (PDV)	11.1[a]	10.1[b]	12.3[a]	10.0[b]	8.2[c]
Urea-N (L)	17.5[a]	14.3[b]	17.1[a]	15.9[b]	14.3[c]
Glucose (L)	15.6	15.3	15.2	14.9	16.0
Uptake by liver tissue for gluconeogenesis :					
Lactate/propionate (L)	-8.2	-9.9	-9.5	-8.3	-9.3
Amino acids (L)	-4.5	-4.2	-4.8	-4.2	-4.3

[a,b,c] Within treatment and within a row, means not sharing superscript differ (P<0.05)