

EFFECT OF SILAGE DIETS ON GLYCOGEN CONCENTRATION IN THE MUSCLE OF YEARLING CATTLE

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There is concern in the Western Australian beef industry that silage-fed steers are more likely to have dark coloured meat than animals fed other diets. Dark coloured meat is closely associated with a high ultimate pH caused by insufficient glycogen at slaughter. The aim of this experiment was to investigate muscle glycogen in steers previously fed poor quality dry pasture and then transferred to diets containing either silage or hay with or without a barley grain supplement.

Forty 10 month old Angus x Friesian or Limousin x Angus Friesian cross steers were weaned and grazed on dry standing improved pasture (DM 88%, ME 6.8 MJ/kg and crude protein 8.6%). At 12 months of age they were stratified on initial liveweight of 304 ± 6 kg ($\pm$ SEM) and allocated, within breed type, at random to 4 dietary treatments: 1. silage (DM 22%, ME 9.6 MJ/kg DM and crude protein 13.5%), 2. hay (86, 10.8 and 16.2, respectively), 3. silage *ad lib* + 3 kg cracked barley grain (89, 11.1 and 10, respectively) and, 4. hay *ad lib* + 3 kg cracked barley grain. Urea at 2% was added to the barley grain. The animals were individually fed to appetite for 7 weeks and liveweight was recorded weekly. Biopsy samples (250 mg) were collected from the *m semitendinosus* (ST) and *m semimembranosus* (SM) at the start and end of the feeding period and analysed for glycogen. The results are shown in table 1.

Table 1. The effect of diet on feed intake, growth rate and level of glycogen and change in muscle glycogen after 7 weeks of feeding yearling steers

	Hay+barley	Silage+barley	Hay	Silage
Intake of Roughage (DM kg/d)	6.3 ^b	7.2 ^a	7.1 ^a	5.9 ^b
Growth Rate (kg/d)	1.2 ^a	1.2 ^a	1.0 ^a	0.6 ^b
Level of Glycogen after 7 weeks of feeding (g/100g muscle)				
<i>m. semimembranosus</i>	2.06 $\pm$ 0.12 ^a	2.13 $\pm$ 0.13 ^a	1.79 $\pm$ 0.11 ^b	1.91 $\pm$ 0.08 ^b
<i>m. semitendinosus</i>	1.48 $\pm$ 0.10	1.52 $\pm$ 0.11	1.35 $\pm$ 0.10	1.30 $\pm$ 0.09
Change in Glycogen after 7 weeks of feeding (g/100g muscle)				
<i>m. semimembranosus</i>	0.60 $\pm$ 0.15 ^a	0.64 $\pm$ 0.19 ^a	0.34 $\pm$ 0.12 ^b	0.29 $\pm$ 0.11 ^b
<i>m. semitendinosus</i>	0.43 $\pm$ 0.11 ^a	0.51 $\pm$ 0.21 ^a	0.23 $\pm$ 0.13 ^b	0.03 $\pm$ 0.11 ^b

Means in the same row with different superscripts are significantly different $P < 0.05$.

The level of glycogen was lower in the ST compared to the SM as would be predicated from the nature of fibre types in each muscle. The SM tends toward a fast red-muscle type while the ST tends toward fast white (Braind *et al.* 1981). The inclusion of barley significantly increased glycogen content in both the SM and ST ($P < 0.05$) while there was no difference between the silage or hay based diets. The level of glycogen increased in both muscle types for all dietary treatments over the 7 week feeding period except when silage was fed alone for the ST. The animals fed silage alone showed the smallest increase in glycogen for both muscle groups and this was associated with a slower growth rate and lower feed intake.

The reduced increase in muscle glycogen over the 7 week feeding period on the silage only diet may be related to the relatively poorer nutritional quality of the silage used in this study. The combination of reduced intake and lower energy density of the silage only diet resulted in a 26% reduction in the intake of metabolisable energy. The level of nutrition is known to be a powerful regulator of glycogen concentration in skeletal muscle (Pethick and Rowe 1995). Despite the lowered muscle glycogen levels on some of the diets all treatment groups had sufficient glycogen to prevent an elevated ultimate pH (ie ≤ 1.0 g/100 g muscle; Warriss 1990).

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