

Effects of plane of nutrition and selenium supplementation of ewes in early and mid-pregnancy on meat quality of offspring

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Introduction Nutritional status in early and mid-pregnancy can affect subsequent offspring productivity. For example, plane of nutrition in early and mid-pregnancy has been shown to have a significant effect on carcass characteristics, with male offspring of dams offered a low plane diet in early pregnancy having poorer carcass conformation and greater fat depths over the muscle *L. dorsi* than lambs of dams offered medium or high plane diets (Muñoz *et al.* 2008a). Supplementation with selenium (Se) during this period had positive effects on measures of lamb viability and survival (Muñoz *et al.* 2008b). The aim of the current study was to investigate the effect of plane of nutrition and selenium supplementation of ewes in early and mid-pregnancy on the meat quality of the male offspring.

Materials and methods Between days 0 and 39 after synchronized mating (early pregnancy, EP) multiparous ewes (n = 99) were allowed 60% (low, L), 100% (medium, M) or 200% (high, H) of requirements for maintenance. Between days 40 and 90 (mid-pregnancy, MP), ewes were allowed either 80% (M) or 140% (H) of their maintenance requirement. Between days -14 and 90 post mating, ewes received Se treatments providing either no Se (Control) or 1 g of Selplex® = intake of 0.5 mg Se/ewe/day (Treated). After day 90 of gestation, all ewes were fed to meet energy and protein requirements for late pregnancy and supplemented with a standard multivitamin and mineral mix (Se content of 10 mg/kg). Male offspring (n = 73) were reared on a grass-based system and slaughtered at 42, 46 or 50 kg live weight (LW). Between ribs 6 and 12 the muscle *L. dorsi* was removed 24 h post-mortem for instrumental meat quality analyses. Measurements of pH, colour, cooking loss, Warner-Bratzler shear force (WBSF) and sarcomere length were recorded using the methods detailed by Moss *et al.* (1993). The data were analysed using the Genstat REML procedure in a 3 (EP plane of nutrition) X 2 (MP plane of nutrition) X 2 (Se supplementation) factorial design. The model examined the effects of the treatments, while adjusting for the effect of dam and sire breed, siblings and fat classification.

Results There were no statistically significant interactions between nutritional treatments, therefore, only main effects are presented (Table 1). Plane of nutrition in early and mid-pregnancy had no effect on any parameter of meat quality (P > 0.05). Selenium supplementation had a significant effect on meat colour with lambs from selenium-treated ewes having increased redness values (a*) of the muscle compared with controls (P < 0.05). A similar tendency was observed for metric chroma values (P = 0.072). Selenium supplementation of ewes had no effects on the sarcomere length, ultimate pH, cooking loss or WBSF of male lambs (P > 0.05).

Table 1 Effect of plane of nutrition and selenium supplementation in early and mid pregnancy on meat quality of offspring

	Early pregnancy nutrition				Mid-pregnancy nutrition			Selenium supplementation			Significance [†]
	L	M	H	s.e.d.	M	H	s.e.d.	Control	Treated	s.e.d.	
Colour [‡]											
L*	42.0	39.8	40.9	2.700	40.5	41.3	2.189	42.2	39.6	2.155	
a*	11.5	11.4	13.2	1.329	12.4	11.7	1.060	11.0	13.0	1.044	*
b*	11.2	11.1	11.1	0.681	11.1	11.2	0.539	10.9	11.4	0.531	
Hue	45.6	44.7	40.8	3.296	42.5	44.9	2.617	45.5	41.9	2.579	
Chroma	16.3	16.0	17.4	1.252	16.8	16.4	0.998	15.7	17.5	0.983	P=0.072
Sarcomere length (mm)	1.78	1.78	1.76	0.029	1.77	1.78	0.023	1.76	1.78	0.023	
Ultimate pH	5.63	5.59	5.63	0.037	5.61	5.63	0.029	5.62	5.61	0.029	
Cooking loss (%)	23.2	22.8	22.8	1.235	23.3	22.6	0.989	22.7	23.2	0.971	
WBSF (kg/cm ²)	1.73	1.83	1.65	0.174	1.67	1.81	0.143	1.77	1.71	0.154	

[‡]Illuminant D65, 2 degree observer; L* lightness, a* redness, b* yellowness, Hue = $\tan^{-1}(b^*/a^*)$, Chroma = $(a^{*2}+b^{*2})^{0.5}$

[†]There was no statistical significance between early and mid-pregnancy treatments; * = P < 0.05.

Conclusion Selenium supplementation of ewes throughout pregnancy, compared with supplementation only in late pregnancy, improved meat appearance by maintaining the redness of the muscle. This could have implications in prolonging meat shelf-life. Plane of nutrition in early and mid-pregnancy of dams had no effects on offspring meat quality.

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