THE EFFECTS ON LAMB SURVIVAL RATE OF SUPPLEMENTING EWES WITH VITAMIN E DURING LATE PREGNANCY

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Introduction

Despite the considerable amount of R&D which has been done to identify those practices which are likely to reduce lamb mortality, an estimated 4 million lambs still die each year with a potential value of £120 M . A major issue to be addressed is the large number of lambs on hill and upland farms which die from hypothermia and starvation (Wiener *et al*., 1983; Merrell, 1996a). There is growing evidence that vitamin E is currently fed at levels below those required by sheep (Stubbings, 1996), and an indication that sub-clinical vitamin E deficiency may reduce lamb vigour (Thomas *et al*., 1995; Williamson *et al*., 1995), thereby potentially increasing lamb mortality. This paper summarises the first year's results of an experiment to study the effects on sheep performance of supplementing hill ewes with vitamin E during late pregnancy

Materials and methods

Two hundred and seventy twin-bearing ewes at each of two hill farms (ADAS Pwllpeiran and ADAS Redesdale) were used for the experiment. At Pwllpeiran ewes were Hardy Speckled Faces, the majority of which were bred pure, but a small number (20%) were mated to Suffolk rams. At Redesdale the ewes were Scottish Blackfaces mated, in approximately equal proportions, to Blueface Leicester and Scottish Blackface rams. At both sites the ewes were housed for the last eight weeks of pregnancy and were fed a basal ration of well fermented *ad libitum* baled silage (DM 273 g/kg, CP 154 g/kgDM, ME 10.3 MJ/kgDM; vitamin E 47 i.u./kgDM) at Pwllpeiran, and restricted hay (DM 939 g/kg; CP 117 g/kgDM; ME 9.0 MJ/kgDM; vitamin E 30 i.u/kgDM) at Redesdale. In addition, at each site, half the number of ewes were supplemented with a standard proprietary sheep nut (Control) and half were fed a vitamin E enriched version of the nuts (Supplemented). The nuts were Pye Sheep Nuts®; DM 880 g/kg; CP 197 g/kgDM; ME 12.7 MJ/kgDM. The vitamin E levels were 46 i.u and 891 i.u/kgDM for standard and enriched formulations respectively. Control and supplemented diets were formulated to provide 50 i.u/head/day and 200 i.u/head/day of vitamin E respectively. Vitamin E supplementation started at housing and ceased at lambing.

At each site, a core of 20 ewes per treatment, were blood sampled pre-treatment and at lambing, when a colostrum sample was also taken from each ewe. Lambs born to core ewes were blood sampled at between 24 and 36 hours after lambing. Blood and colostrum samples were analysed to determine vitamin E levels, and blood samples only were also analysed for selenium (as measured by GSHPx) levels.

Ewes were weighed and condition scored at the outset, at the point of lambing and at on average 30 days (Marking) after lambing. Lambs were weighed at birth, at marking and at weaning (mean 120 days).

At Redesdale only, the times taken for lambs to attempt to stand, stand, attempt to suck and suck were recorded. Lamb deaths were recorded throughout.

Blood plasma determinations, colostrum vitamin E levels, ewe and lamb live weights and measures of lamb vigour were analysed by analysis of variance. Ewe condition scores and lamb mortality data were analysed by Chi-squared.

Results and discussion

Selenium status was adequate throughout the experiment and results were therefore not confounded by low selenium levels.

For control and supplemented treatments respectively the diets provided 44 i.u and 196 i.u. and 47 i.u. and 198 i.u. of vitamin E per head per day at Pwllpeiran and Redesdale respectively.

At the start of the experiment ewe plasma vitamin E levels were considered to be at the lower limit of the normal range (> 2.3 µmol / l). Despite ewes being clinically normal, supplementing ewes with vitamin E either maintained or raised significantly ewe plasma vitamin E levels over the last eight weeks of pregnancy (Table 1). At Pwllpeiran, plasma vitamin E levels of control ewes, declined significantly over this period, whereas those of supplemented ewes, increased slightly ($P > 0.05$). In contrast, at Redesdale, ewe plasma vitamin E levels of control and supplemented ewes increased significantly ($P < 0.05$) in late pregnancy, but with the increase most marked in supplemented ewes. The difference in the response of unsupplemented ewes is difficult to explain, but may have reflected the different forages fed. It is likely that rumen retention time was shorter on the silage based diet, and this may have adversely affected vitamin E absorption from the rumen.

Table 1.
Effects of supplementing ewes with vitamin E on plasma vitamin E levels of ewes and lambs and on vitamin E levels in colostrum (µmols/litre α-tocopherol).

	Pwllpeiran		Redesdale	
	Control	Supplemented	Control	Supplemented
Ewe plasma vitamin E				
At start	3.544	3.337	2.889	2.842
At lambing	2.500[a]	3.479[b]	5.721[a]	7.421[b]
Colostrum vitamin E	26.94[a]	38.91[b]	27.283[a]	34.247[b]
Lamb plasma vitamin E	6.437[a]	9.132[b]	5.461[a]	7.136[b]

For each farm, figures in rows with different letters indicate significant differences at $P < 0.05$

Table 2.
Effects of supplementing ewes with vitamin E on ewe and lamb performance

	Pwllpeiran		Redesdale	
	Control	Supplemented	Control	Supplemented
Ewe live weights (kg)				
At start	50.9	50.9	62.0	62.1
At lambing	58.9	58.4	67.9	68.8
At marking	53.4	53.5	60.0	60.4
Ewe condition scores				
At start	3.36	3.35	2.60	2.60
At lambing	3.16	3.18	2.55	2.53
At marking	2.87	2.84	2.62	2.62
Lamb live weights (kg)				
At start	3.4	3.4	3.9	4.0
At lambing	12.8^{b}	13.3^{a}	11.7^{b}	12.3^{a}
At marking	25.1	25.6	28.6	29.3

For each farm, figures in rows with different letters indicate significant differences at $P < 0.05$

Vitamin E supplemented ewes had significantly higher plasma vitamin E levels at lambing, and this was associated with significantly higher concentration of vitamin E in their colostrum (Table 1). This in turn impacted on vitamin E levels in lamb plasma and lambs born to supplemented ewes had significantly higher levels than those born to control ewes. This finding was in good agreement with results reported by Pherson *at al.* (1990) but was achieved by supplementing ewes with a lower level of vitamin E, for a longer duration. This result suggests that duration of supplementation may be of greater importance than rate of supplementation.

Supplementing ewes with vitamin E had no significant effect on ewe live weights and condition scores or on lamb birth weights, but lambs born to supplemented ewes grew faster than those born to control ewes, and were significantly heavier at 30 days of age (Table 2), in agreement with results reported by Williamson *et al.* (1995). Treatment differences in lamb weaning weights were not significant.

Although treatment differences in the measurements of lamb vigour were not significant, lambs born to vitamin E supplemented ewes tended to be more vigorous immediately following birth (Table 3). This was a similar result to those reported by other authors (Thomas *et al.*, 1995; Williamson *et al.*, 1995). Improved lamb vigour did not impact on lamb survival rate, which probably reflected the fact that lambs were housed for a period immediately after lambing and were therefore not subjected to severe environmental stress. However, the fact that lamb born to supplemented ewes acquired milk on average three minutes earlier may well be important to the survival of lambs born outdoors, in extreme weather conditions.

Table 3.
Effect of supplementing ewes with vitamin E on lamb vigour (Redesdale only)

Mean time (mins.) from birth to:	Control	Supplemented
Attempting to stand	12.9	11.4
Standing	15.8	15.9
Attempting to suck	28.8	25.8
Sucking	39.7	35.7

There were no significant treatment differences in the number of stillbirths at either farm. Thereafter, favourable weather conditions at lambing time resulted in about half the number of lamb deaths normally experienced on the two farms (Merrell, 1996b), and in the context of low levels of lamb mortality (3%) supplementing ewes with vitamin E had no beneficial effect on lamb survival (Table 4).

Table 4.
Effect of supplementing ewes with vitamin E on the numbers of stillbirths and neonatal mortalities

	Pwllpeiran		Redesdale	
	Control	Supplemented	Control	Supplemented
Number of stillbirths	14	18	6	6
Number of lambs born alive	234	238	272	256
Number of neonatal mortalities	7	8	8	9

Conclusions

Vitamin E supplementation of housed, twin-bearing ewes during late pregnancy either maintained or significantly raised ewe plasma vitamin E levels compared with control ewes, and this was associated with significantly higher concentrations of vitamin E in their colostrum. In-turn lambs born to supplemented ewes had significantly higher plasma vitamin E levels than those born to control ewes. There were no significant differences between treatments in measurements of lamb vigour, but those born to ewes supplemented with vitamin E tended to be more vigorous immediately following birth, grew faster and were significantly heavier at 30 days of age than those born to unsupplemented ewes. In a mild season, characterised by atypically low levels of lamb mortality, supplementing ewes with vitamin E had no beneficial effect on lamb survival.

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