COBALT, SELENIUM AND COPPER RESPONSES IN SHEEP GRAZING SALINE LAND IN THE UPPER SOUTH EAST OF SOUTH AUSTRALIA

N.J. EDWARDS[A], *E.A. ABRAHAM*[A], *M.L. FENTON*[A], *J.D. MCFARLANE*[B], *A.D. CRAIG*[A] *and J.E. HOCKING EDWARDS*[A]

[A] South Australian Research and Development Institute, Struan Agricultural Centre, Naracoorte, SA 5271
[B] Rural Solutions SA, Struan Agricultural Centre, Naracoorte, SA 5271

The trace mineral status of livestock in the Upper South East of South Australia was studied in the late 1980s, indicating marginal and spasmodic deficiencies of cobalt, selenium and copper (Koh *et al*. 1993). Despite the extensive nature of the survey, it did not concentrate on saline areas and only included samples from cattle. As part of the Sustainable Grazing on Saline Land project, the trace mineral status of treated (with cobalt, selenium and copper) and untreated sheep was monitored to provide a basis for recommending prophylactic treatment of animals grazing these areas.

Sixty-eight sheep grazing puccinellia-dominant pasture were split into 2 groups in June 2003. Thirty sheep were dosed with a cobalt (Co), a selenium (Se) and a copper (Cu) 'bullet' (Coopers® Permatrace®, Schering-Plough Pty Ltd) and remained on similar pasture. The remaining 38 sheep were left untreated (control) and were moved to adjacent unimproved volunteer pasture dominated by sea barley grass and samphire. Blood samples were collected from the jugular vein into Li-heparin tubes prior to dosing, and 4 months later in spring. The animals were weighed on each occasion. Plasma vitamin B_{12} levels (indicating Co status) were determined by a radioisotope dilution assay using a commercial kit (Diagnostic Product Corporation), Cu levels using flame atomic absorption after protein precipitation with TCA, and Se levels using a fluorometric method.

Table 1. Liveweight and plasma mineral concentrations for dosed (with Co, Se and Cu 'bullets') and control sheep.

		Liveweight ± sem (kg)	Vitamin B_{12} ± sem (pmol/L)	Selenium ± sem (mmol/L)	Copper ± sem (mmol/L)
Control	June	37.12 ± 3.64	849 ± 45.6	0.87 ± 0.022	14.4 ± 0.53
	October	45.91 ± 5.41	149 ± 12.4**	0.13 ± 0.007*	14.4 ± 0.75
Dosed	June	35.8 ± 4.13	891 ± 51.6	0.84 ± 0.023	14.5 ± 0.36
	October	50.73 ± 6.36	590 ± 49.0	0.82 ± 0.025	18.6 ± 0.85
Deficient (Adequate)			<200 (>400)	<0.15 (>0.32)	<5 (8-30)

*P<0.05; **P<0.01 for comparison with the level considered deficient for this vitamin/mineral

Vitamin B_{12}, Se and Cu concentrations were within normal ranges in all animals at the June sampling prior to dosing and levels were maintained in these ranges in animals that were dosed with Co, Se and Cu (Table 1). In contrast, the vitamin B_{12} and Se status of the control animals dropped to the deficient range in October. Although the groups were grazing different pastures when sampled in October, it is our belief that the result would have been similar if the pasture composition had been the same for both treatments, since the paddocks had similar soil types and fertiliser histories. These deficiencies are not surprising in light of previous findings for cattle in this region (Koh *et al*. 1993), and the fact that the October blood samples were collected when the concentration of minerals in pasture were at their lowest because pasture growth was at its highest (Masters and White 1996). Copper status, however, did not decrease, staying in acceptable ranges regardless of supplementation. Thus, it is concluded that the use of Co and Se supplements is warranted in this area, but that the use of Cu may not be necessary. Further work may be useful in determining the most appropriate form and timing of applying these minerals, and variation in response by different stock classes.

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Email: edwards.nick@saugov.sa.gov.au