

5. Vitamin E

Vitamin E functions as an antioxidant in animal tissues, and deficiency predisposes sheep to muscle damage (myopathy). Selenium and vitamin E have similar roles in the prevention of muscle damage by oxidants produced during tissue metabolism, but they have independent sites of action. Selenium treatment therefore reduces the likelihood of muscle damage from combined deficiencies of selenium and vitamin E. Extreme vitamin E deficiency alone may induce muscle damage in sheep in Victoria, (Hucker 1983), and elsewhere, (Steele et al. 1980), even when selenium status is adequate.

Vitamin E is most abundant in green pastures. Several forms of vitamin E are present in herbage as tocopherols (Hucker 1982). The alpha-tocopherol form is the most important with concentrations ranging from 30 to 60 mg alpha-tocopherol/ kg wet weight.

5.1 Occurrence of vitamin E deficiency in Victoria

In Victoria, vitamin E deficiency occurs mainly in sheep less than 18 months of age grazing on oat stubble or grass pastures that have been dry for several months and contain no green vegetation (Hucker 1983). The disease has also been observed in adult sheep on some properties. Sheep have been affected in north-eastern Victoria, Gippsland and the Western District, particularly during extended dry periods in autumn when grain supplements were fed. Widespread cases occurred during the summer and autumn of the 1982-83 drought.

Vitamin E deficiency has occurred in housed sheep fed dry feed for extended periods (Hucker 1982), and in sheep fed on grain (Hucker 1983). Housed sheep supplemented with 50 mg alphas-tocopherol acetate/day had 5 kg higher body weights and produced 16% more wool in six months than untreated sheep (Hucker 1983).

5.2 Signs of vitamin E deficiency

Affected lambs show signs of lameness. Commonly the lambs are illthriftily anyway due to the quality of the available feed. The number affected in flocks ranges from 5 to 10%. Usually lambs are found dead, but others may be reluctant to move, collapse when driven or may be unable to stand. They may pass red-brown stained urine.

5.3 Diagnostic methods

Clinically, vitamin E-responsive white muscle disease cannot be differentiated from selenium-responsive white muscle disease. To diagnose myopathy from either cause, blood samples are collected from lambs in the flock for assay of the enzyme creatine kinase released from damaged muscles into plasma. Confirmation of this diagnosis requires histopathology of muscle tissue.

The selenium nutrition is assessed by blood glutathione peroxidase activity, and vitamin E nutrition is assessed from plasma vitamin E concentration. Plasma vitamin E (alpha-tocopherol) concentrations less than 3 umol/l indicate the vitamin E intake of sheep is inadequate.

Plasma vitamin E assays can be arranged through the Regional Veterinary Laboratories. Special precautions have to be taken during collection and shipment of samples (Sinclair and Slattery 1978) and the details should be obtained from the laboratory.

5.4 Treatment

Usually flocks are drenched with selenium (0.1 mg Se/kg liveweight) if they are in a marginal selenium area. Affected flocks in extended dry periods should be given a drench containing 1 to 4 g vitamin E (Hucker 1983, Steele et al. 1981). This treatment has provided protection for up to six weeks.

Vitamin E preparations available for drenching sheep include Microvit E 50 E.S. (May and Baker) and Robimix E type 50 SD (Roche).

5.5 Prevention

Ensuring that lambs have adequate selenium nutrition is one way of minimising the risk of myopathy due to vitamin E deficiency. A practical way of preventing the disorder is to provide lambs with a green pick (even edible green weeds) in summer. Sheep on grain rations alone require 50 mg alphas-tocopherol acetate/day (Hucker 1983).

References

- Hucker, D.A. (1982) Nutritional problems in the "Sharlea" (housed superfine wool) sheep industry. In "Australian Advances in Veterinary Science, 1982". (M.G. Cooper, Ed.) Australian Veterinary Association, Artarmon, NSW. p213-215.
- Hucker, D.A. (1983) White muscle disease in sheep in the Western District during

the drought of 1982/83—Use of vitamin E treatments. In "Trace Element Review papers, 1982". Agricultural Services Library, Department of Agriculture, Victoria.

Sinclair, A.J. and Slattery, W. (1978) Blood collecting tube as a contamination source in vitamin E fluorometry. *Clinical Chemistry*, 24:2073.

Steele, P., Peet, R.L., Skirrow, S., Hopkinson, W. and Masters, H.G. (1980) Low alphatocopherol levels in liver of weaner sheep with nutritional myopathy. *Australian Veterinary Journal*, 56:529-532.

Steele, P., McKenzie, D.P., Skirrow, S., Peet, R.L. and Doncon, G. (1981) Selenium and tocopherol treatment of ovine weaner nutritional myopathy in "Trace Element Metabolism in Man and Animals, 4". (J. McC. Howell, J.M. Gawthorne and C.L. White, Eds.) pp. 210-213, Australian Academy of Science, Canberra.