

# Supplementing stock with selenium by applying prills added to fertiliser

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There appears to be some misunderstanding around the role of selenium (Se) prills in maintaining adequate selenium levels in grazing livestock, and this short communication is intended to clear up some of the misconceptions.

Selenium prills (such as Selcote Ultra from Ballance, and Selprill Double from Ravensdown) both provide 10 g of elemental Se per hectare, and successfully maintain blood and liver selenium levels of grazing animals above the established deficiency range (ie within the adequate range) for 12 months after application.

For example, in cattle Se prills will maintain serum concentrations between 200 and 400 nmol/l (adequate level is above 140 nmol/l), and blood Se concentrations can be maintained above 600 nmol/l (adequate level is above 250 nmol/l), over a 12-month period. The scientifically established tissue selenium reference ranges for New Zealand sheep and cattle grazing pasture are shown in the table.

However, many veterinarians and farmers prefer to see serum Se concentrations between 500 and 1,000 nmol/l, or higher. These values are extrapolated from overseas situations where animals are housed indoors and fed on total mixed ration diets. Some overseas studies in dairy cows have shown that increasing blood Se concentrations reduces the incidence of mastitis (ie reduced somatic cell counts) and also of retained placentas. However, New Zealand studies have not confirmed this and in fact have found no relationship between somatic cell counts and blood Se concentrations over 250 nmol/l. In summary, no published scientific evidence from New Zealand studies supports the use of these higher Se reference ranges for our grazing livestock.

The only case for increasing Se intakes and blood Se concentrations above the recommended New Zealand reference range in dairy cows is to increase the Se concentrations in milk to improve the Se intakes of the population, particularly children.

If farmers wish to adopt the higher Se levels then it should be made clear that:

- no production response will result from getting the tissue Se concentrations this high;
- Se prills on their own are unlikely to sustain serum levels this high over 12 months, although one recent study with dairy cows did show blood Se concentrations were maintained above >600 nmol/l for a year;
- other forms of Se supplementation will be required to get the serum Se concentration above 1,000 nmol/l.

While many veterinarians advocate higher dietary Se requirements (ie higher serum Se concentrations) for high-performing animals, farmers may perceive that the selenium prills are not 'doing the job'. This is highlighted when veterinarians comment that serum Se concentrations of 200–300 nmol/l are at the 'lower end of normal' and, while no Se deficiency diseases would be observed, some farmers could perceive this to mean 'low'. In reality, serum Se concentrations between 85 and 140 nmol/l reflect the marginal range and therefore by definition Se supplementation may or may not result in a growth or production response.

Despite the fact that in the 1970s and early 1980s the veterinary profession objected to the introduction of selenium applications via addition to fertiliser, on the grounds that selenium in excess quantities can be toxic to animals and humans, research by Dr John Watkinson of MAF Agricultural Research Division, and latterly AgResearch, allowed the legal acceptance of its use in this way. This resulted in the development of AgSel and Selcote Ultra prills, and more recently Selprill Double.

## Tissue reference ranges for Se established from Se supplementation animal response studies

Tissue	Species	Low	Marginal	Adequate	Units
Pasture	Sheep/cattle	<0.03		>0.03	mg/kg
Serum	Sheep/cattle	<85	85–140	>140	nmol/l
Blood	Sheep/cattle	<130	130–250	>250	nmol/l
Liver	Sheep	<250	250–450	>450	nmol/kg FW
Liver	Cattle	<600	600–850	>850	nmol/kg FW

The most common Se prills used in agriculture today are Selcote Ultra (1% slow-release Se) and Selprill Double (2% slow-release Se). During the development of Selprill Double in 2002/03, Professor Ron McLaren of Lincoln University undertook pasture field studies, and Dr Neville Grace of AgResearch did grazing studies, to prove the efficacy of various Se prills in elevating pasture and animal Se status to prevent Se deficiency diseases.

Professor McLaren's pasture trial showed that a fast-release Se chip similar to AgSel elevated pasture Se levels above 0.03 mg/kg for 120 days after application, while Selcote Ultra and two Ravensdown experimental prills maintained pasture Se levels above 0.03 mg/kg for more than 350 days.

Development of Selprill Double resulted in a 2% Se prill and this was evaluated in animal grazing trials at Flock House, Bulls, by Dr Grace. Both Selprill Double (in green) and Selcote Ultra (in blue) applied at 10 g Se/ha elevated pasture levels of Se above the adequate level of 0.03 mg/kg for more than 300 days (Figure 1).

In terms of the blood, serum and liver concentrations, and glutathione peroxidase (GSH-Px) activity, of the dairy cows grazed on three self-contained farmlets, both prills maintained concentrations well into the adequate reference range shown in the table for more than 365

days (Figures 2 and 3), when reapplication of prills would be expected. Similar results were obtained with sheep in a separate trial.

In summary, it is clear that selenium prills are an appropriate and cost-effective means of ensuring animals grazing Se fertilised pastures will be more than adequately protected against selenium deficiency for a 12-month period.

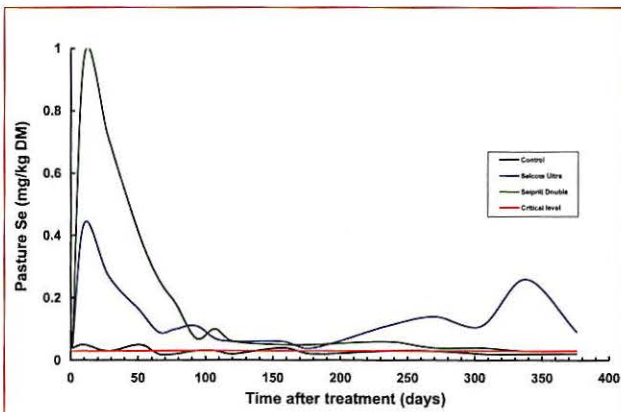


Figure 1: Pasture Se concentrations after treatment with Se prills (10 g Se/ha)

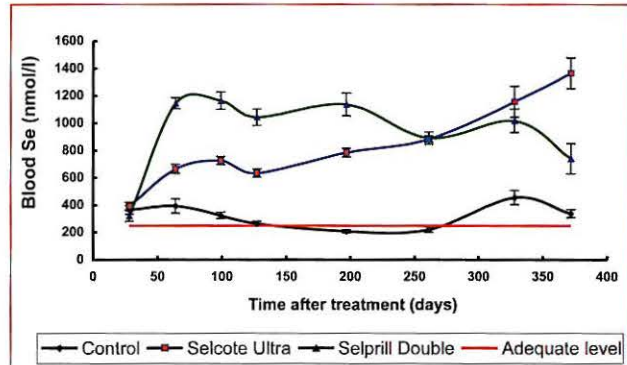


Figure 2: Effect of Se prills on serum Se concentrations

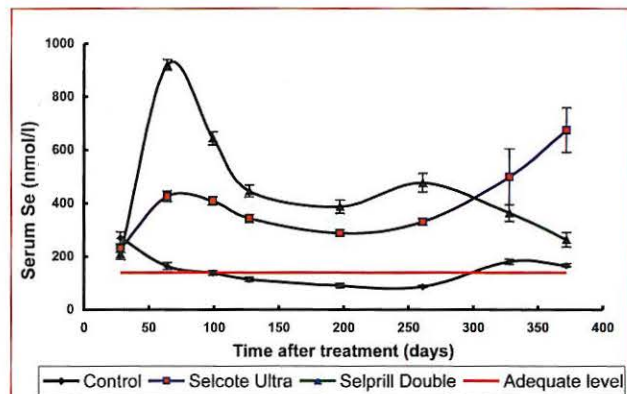


Figure 3: Effect of Se prills on blood Se concentrations

## 2008 Wildlife Society Conference

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