Milk production from cows grazing perennial ryegrass pastures infected with wild or AR1 endophyte in New Zealand

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Introduction Most perennial ryegrass (*Lolium perenne*) cultivars in New Zealand are available with either the natural wild endophyte (*Neotyphodium lolii*); the AR1 novel endophyte (no lolitrem B or ergovaline production); or endophyte-free. Although wild endophyte protects ryegrass against insect attack, improving pasture persistence, it can also cause ryegrass staggers and reduced animal performance. Endophyte AR1 does not cause ryegrass staggers but still protects against insect pests such as Argentine stem weevil (*Listronotus bonariensis*). A 3-year farmlet experiment was carried out to evaluate the effects of AR1 and wild endophyte-infected ryegrass on pasture performance, milk production and cow health.

Materials and methods The experiment was conducted at Dexcel, Hamilton, New Zealand (37°47′S, 175°19′E, 40 m a.s.l.). Two farmlets (7 ha each) were sown with perennial ryegrass infected with either wild endophyte or AR1 endophyte, and with white clover (*Trifolium repens*). Farmlets were managed as self-contained systems using decision rules developed from other Dexcel farm systems experiments. Treatments were rotationally grazed by spring-calving Holstein-Friesian cows from September 2000 to May 2003, over 3 lactations (Bluett *et al*., 2003). The mean stocking rate was 20 cows/farmlet or 2.9 cows/ha.

Results The AR1-infected ryegrass pastures were free of contamination from wild endophyte-infected ryegrass for at least 3 years after establishment, as confirmed by low concentrations of lolitrem B in ryegrass samples. Mean annual pasture production (15.0 vs 14.6 t DM/ha, s.e.d.=0.71, p=0.542) and ryegrass tiller density (3243 vs 3203 tillers/m^2, s.e.d.=242.2, p=0.874) were similar across AR1 and wild endophyte-infected ryegrass farmlets. A combined analysis over the 3 lactations, showed a significant 9% advantage in total milk production to cows grazing AR1-infected ryegrass pasture (Table 1). Cows grazing AR1-infected ryegrass produced more milk in summer (16.0 vs 14.7 L/cow/day, s.e.d.=0.48, p=0.009) and autumn (11.5 vs 10.3 L/cow/day, s.e.d.=0.47, p=0.026), and showed a similar trend in spring (19.8 vs 18.9 L/cow/day, s.e.d.=0.67, p=0.176). Milk composition was similar in all lactations. Ryegrass staggers occurred in cows grazing wild endophyte-infected pastures in January 2001, coinciding with the highest concentrations of lolitrem B over the 3 lactations (>3.5 mg/kg DM). Cow temperatures, respiration rates and plasma prolactin concentrations measured during periods of heat stress (>25°C) were seldom affected by endophyte treatment.

Table 1 Milk production and composition from cows grazing perennial ryegrass pastures infected with AR1 or wild endophyte (mean of 3 consecutive lactations)

	AR1	Wild	s.e.d.	p
Milk production				
Total (L/cow)	4016	3690	129.7	0.015
Daily (L/cow per day)	16.6	15.5	0.52	0.038
Milk composition				
Protein (%)	3.40	3.38	0.055	0.741
Fat (%)	4.28	4.25	0.100	0.799
Lactose (%)	4.92	4.89	0.033	0.412

Conclusions Results showed that renovating pastures with AR1-infected ryegrass can improve milk production without incidence of ryegrass staggers. On average over 3 lactations, cows grazing AR1-infected ryegrass pasture produced 326 L/cow more than those grazing wild endophyte-infected pasture. The magnitude of treatment differences varied from week to week, highlighting the benefits of measuring endophyte effects over the entire lactation and for consecutive years to allow for seasonal variations in alkaloid production. Although initially only a small portion of the farm would be regrassed with AR1-infected ryegrass, it would provide safe feed for animals affected by ryegrass staggers.

References

Bluett, S J., E.R. Thom, D.A. Clark, K.A. Macdonald & E.M.K. Minneé (2003). Milksolids production from cows grazing perennial ryegrass containing AR1 or wild endophyte. *Proceedings of the New Zealand Grassland Association,* 65, 83-90.