Experiences of ryegrass endophyte on farms on the East Coast of the North Island

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Abstract

A case study of a Hawke's Bay farm with a history of ryegrass staggers (RGS) and results of a survey of veterinarians from three regions are presented. A RGS outbreak in 1989 on the 'Tunanui' property at Sherenden resulted in the loss of 900 sheep and three cattle, with total costs estimated to be $61,000. There have been no severe outbreaks since then, despite similar climatic conditions occurring. The probable reason for this is a combination of improved awareness of RGS and conscious avoidance of the problems, and the indirect effects of other changes to farm management. The survey of veterinarians showed a rise in the prevalence of ryegrass endophyte related disorders in Manawatu and Waikato between the 1980s and 1990s, but no change for East Coast regions. Veterinarians spend very little time assisting clients with endophyte related problems, despite 41% of clients having problems. It is recommended that veterinarians provide more prevention advice to farmers, and farm management practices that successfully reduce RGS be promoted.

Keywords: cattle, deaths, disorders, East Coast, farm, prevalence, remedies, ryegrass staggers, sheep, veterinarians

Introduction

The purpose of this paper is to provide symposium attendees with a perspective of how ryegrass endophyte affects a typical East Coast North Island farm. The paper also presents a picture of the on-farm effects through the eyes of veterinarians.

Introduction to 'Tunanui'

'Tunanui' is a sheep and beef farm at Sherenden, 28 km west of Napier (37° E, 31° N) at an altitude of 275 to 390 metres above sea level. It has been farmed by the Russell family since 1861, and is currently run by Andrew and Sam Russell, and their father and mother John and Phillida (who have run the property since 1961). 'Tunanui' is 1012 ha in size (729 ha effective) and has a mix of easy contours, rolling hills, and steep sunny faces. Soils are clay-based sandy loams with an average Olsen phosphate level of 22 μg/ml, pH of 5.9, sulphate of 12, and potassium (quick test) of 9.5. The farm receives 150 kg/ha of single superphosphate each autumn, and lime as required by pH tests. Annual rainfall averaged 1095 mm between 1981 and 1993 (range 550 to 1600 mm).

In 1995 the Russells purchased the 486 ha property 'Babylon' at Glen Ross, 15 km west of 'Tunanui', closer to the Kaiweka ranges. 'Babylon' is cooler, has higher rainfall, and is run together with 'Tunanui' as the 'summer-safe' part of the farm to grow ewe lambs. Soils are pumice, with an average Olsen phosphate of 17 μg/ml (range 7–37).

The two farms run 5500 ewes, breeding their own replacements, finishing all other lambs (except in drought years), and buying in lambs for finishing when appropriate. Approximately 340 Hereford breeding cows are run, their own heifers are retained as replacements and other calves are finished for slaughter by 20 months of age. One hundred Friesian dairy weaner bulls are purchased each May and run in a "Techno grazing system". Total stock units (MAF units, Cornforth & Sinclair, 1984) in winter 1999 were 13 259 (10.9 su/ha) with a sheep to cattle ratio of 1.9:1.

Since 1994, about 12 ha of summer greenfeed crops have been grown each year on 'Tunanui' for lamb finishing. These areas are then sown in high endophyte perennial ryegrass-based pastures, mixed with clovers, chicory and plantain (Table 1). One pasture was sown in a mix of tall fescue and cocksfoot in 1996, and this is now dominated by cocksfoot. The Russells are not concerned about the effect on the incidence of RGS through increasing the area of high endophyte pastures, as there are other pastures on the farm that can be grazed during periods of potential problems. They believe they could establish another 100 ha of high endophyte pasture (total of 180 ha or 25% of 'Tunanui') before they need to consider endophyte-safe pastures. They have not had severe RGS on the new pastures, and this may be because there is good chicory content in autumn, and these pastures are not grazed to low levels for long periods.

Silage harvesting and storage is an important drought management policy that has recently been adopted. During the 1998 drought, 1000 tonnes of silage was fed

out to reduce liveweight loss in the animals left on the farm after earlier sale of trading lambs and cull stock. The aim is to build up to a reserve of 2500 tonnes of silage for use only in droughts, by making 400–500 tonnes per year (although 1100 tonnes were harvested in spring of 1998 to replace reserves). Other drought strategies include changing to more trading stock, growing summer greenfeed, selling trading and cull stock early, and sowing new pastures.

Table 1 Seed mix used in 1999 on 'Tunanui'.

Cultivar	Sowing rate (kg/ha)
Bronsyn* high endophyte perennial ryegrass	12
Vedette high endophyte perennial ryegrass	8
Grasslands Tahora white clover	2
Grasslands Prestige white clover	2
Grasslands Puna chicory	2
Grasslands Lancelot plantain	2
TOTAL	28

* Yatsyn 1 was used before 1999

History of ryegrass staggers

RGS is noticeable on the farm in 8 out of 10 years. In 6 out of 10 years RGS symptoms occur but there is no stock death. In 2 out of 10 years there are a significant number of stock deaths due to RGS. The deaths are caused mainly by misadventure (drowning, falling, being trapped between objects), the exception being 1989, which was the worst in 40 years for RGS on 'Tunanui'. There had been a drought over summer with normal signs of RGS in lambs. The first light rain fell on 22 March. On 26 March some calves still on their mothers were staggering and 36 weaners were withdrawn from a livestock sale because they were affected by RGS. Heifer calves were weaned onto hay with some still staggering, and two died.

After 12 mm of rain on 31 March, RGS became more noticeable in the sheep, and 67 of 1000 two-tooth wethers brought in for shearing had to be transported on trucks. On 13 April, 18-month-old heifers started staggering, and on 16 April five four-tooth ewes drowned in a dam. When inoculating the two-tooth ewes, 20 were found dead and 120 had to be inoculated as they lay on the ground instead of being taken to yards.

On 27 and 28 April, 98 sheep were found dead. On 1 May, when shedding the rams from the ewes, the Russells could not move the stock so they "cut-out" the rams around the ewes as they fell over. Two rams died.

On 2 May, John picked up 70 dead ewes, and another 80 were staggering severely. The staggering ewes were drenched with cider vinegar and propped against fences in an effort to save them, but they still died. On 15 May, the Russells killed 152 sheep for dog tucker and pelts because they were dying. The RGS reduced after this date.

During this period in 1989, 900 sheep and three cattle died. Most died in the paddock and not from misadventure. Animals would stagger, then fall and be unable to stand, and then die from thirst and/or starvation. The value of animals lost was $16,000 in 1999 terms, plus $12,000 from the 480 lambs that would have been born from the ewes that died. The stock that survived had reduced liveweight and subsequent production. The lambing percentage in 1989 was 81% when 110% was expected, reducing the number of lambs born by 1330 and potential lamb income in 1989–90 by $33,000. Total production losses from this staggers event were at least $61,000. There was also a lot of mental suffering by the farmers and workers. Two of the shepherds employed at the time resigned because of the stress of watching their animals die.

We need to understand why the outbreak occurred in late autumn. The outbreak seemed to peak after light rain, a point previously noted by Byford (1979). This produced some growth in surviving ryegrass plants, most likely to have endophyte and toxins. Combined with hungry stock eating them to the ground, this led to high ingestion of toxins. Before the rain in late March there may not have been enough ryegrass herbage for animals to eat and therefore ingest toxins (Keogh 1983). Severe RGS have been observed in July in Canterbury (L Fletcher pers. comm.).

Why no outbreaks since 1989?

Since 1989 there have been years with signs of RGS symptoms, and some deaths through misadventure, but nothing as severe as 1989. This is despite two summer/autumn droughts that produced climatic events similar to those in 1989. Many farmers believe that the main reason for the absence of outbreaks is that the 1989 event (and for some, a 1983 event) culled out many of the ewes which were genetically susceptible to RGS, and the surviving ewes later produced progeny that inherited their tolerance of RGS. This theory is probably not correct however, as trials at AgResearch, Ruakura, have found that hertitability of RGS tolerance is relatively low. Three years of intensive selection for RGS tolerance led to only small changes in the RGS tolerance of a flock (Morris *et al.* 1999).

There would have been only a small amount of resistance selection from a single event. Also, the Russells needed more sheep when they bought their second property, so ewes with varying tolerance to RGS have been introduced to the flock since 1989. The

Russells buy their rams from a stud on a neighbour's farm, and these would have been selected against RGS susceptibility in the same environment.

The reasons for fewer outbreaks occurring on this farm in the 1990s are more likely to be due to a combination of improved awareness and conscious avoidance of the problems, and indirect effects of other farm management changes. The 'Babylon' property is safe from RGS symptoms because pastures have low amounts of ryegrass and the climate is cooler and moister. The Russells graze their ewe lambs at 'Babylon' over summer and autumn, thereby reducing the number of the most susceptible class of lambs on 'Tunanui' over this period.

In dry seasons the Russells make earlier decisions to sell some lambs as 'stores' and process others at lighter weights. This also reduces the number of lambs on the farm in February and March in dry years, compared with the 1980s. Silage is now fed during droughts and, although it is not 100% of the animals' diet, it reduces the amount of toxin an animal would ingest each day. Summer greenfeed crops are now grown and this results in lambs being removed from pastures over the late summer period. Since 1989 the worst paddocks for RGS have been identified, and grazing of these is avoided during dry autumns, or they are grazed with less susceptible stock classes (e.g., cows). Stock are now moved more frequently between paddocks, which is a recommended strategy to reduce RGS problems (Keogh 1983).

There may also have been less ryegrass in pastures in the 1990s as a result of three severe droughts, and less sowing of new pastures than in other regions due to lower farm returns.

Other effects on production

The Russell's are unable to quantify the sub-clinical effects of ryegrass endophyte because they have no endophyte and endophyte-free ryegrass pastures for comparison. They feel that there are effects on production with lambs growing poorly over January and February despite having good quantities of quality pasture to eat. The endophyte may also affect the long-term production of ewe lambs.

Veterinarians and consultants survey

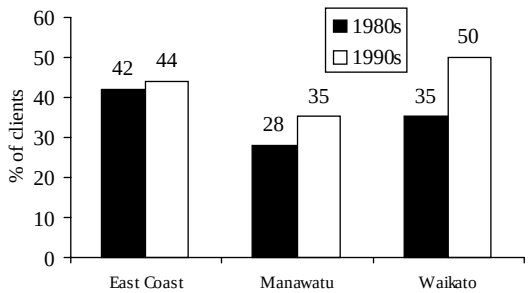
Method

A 12-question survey was posted to all rural veterinarian practices in East Coast regions of the North Island, Manawatu, Bay of Plenty, and Waikato in May 1999. Forty-seven surveys were posted and 16 completed and returned (31%). The farm types included sheep and beef, and dairying.

Results

On average, respondents indicated that 41% (range 10–90%) of their clients had endophyte related disorders, and this had changed only slightly between the 1980 (39%) and 1990 (43%) decades. A higher percentage of East Coast clients observed endophyte disorders, but the proportion of clients observing disorders had increased more rapidly in Manawatu and Waikato between the 1980 and 1990 decades (Figure 1). Reasons given for the increases in these regions include more new varieties of high endophyte ryegrass being planted, increases in stocking rates and lower grazing levels, and greater awareness of the problems. The districts reporting the highest percentage of clients affected were central Hawke's Bay, Gisborne, and Dannevirke (85, 75, and 65% respectively).

Figure 1 Percentage of veterinary clients who have ryegrass endophyte disorders, in three regions and over two decades.



Of the types of disorders observed, visual symptoms of RGS were the most common (average of 38% of clients overall), followed by reduced liveweight gain (7.7%) and feed intake (5.3%), deaths (2.8%), ataxia (2.7%), and heat stress (2.3%).

Of the remedies used to treat animals with RGS symptoms, Nutrimol™ and the use of other grass species were the most common (used by 31% of farms). The other common remedies include: cider vinegar (25%), $KCl/MgSO_4$ (25%), changes to grazing management (25%), seaweed extract (13%), and Biomos™ (13%). Respondents were asked to rank the success of remedies used, 5 for the most successful and 1 the least. The remedies considered most successful were: using other grass species (total score of 20), changes to grazing management (18), $KCl/MgSO_4$ (14), and shifting stock (11). Other less successful remedies were Nutrimol™ (9), Biomos™ (6), zinc (6), seaweed extract (5), cider vinegar (5), and greenfeed crops (4).

Low altitude and coastal districts with dry and warm climates were identified as the worst environments for RGS symptoms.

Most veterinarians (94%) spend less than 10% of their time with clients dealing with ryegrass endophyte disorders.

The respondents estimated that ryegrass endophyte reduced farm production by 16.4% in the worst cases, and 6.4% on average. They estimated farm profits were reduced by 12.2% in the worst cases, and 6% on average.

The most common reasons cited for severe outbreaks of RGS were climate (14 responses), pasture type (10), grazing management (7), and stage of pasture growth (4). Other reasons given were stock type, time of the year, underfeeding animals, and air temperature.

The worst years that respondents could recall for RGS were 1999 and 1998 (7 responses each), followed by 1997 and 1989.

Information that was identified as lacking for veterinarians and advisers included: diagnostic tools for identifying reduced liveweight gain and reproduction problems related to endophyte (6 responses), quantifying the sub-clinical effects (5), the economic impacts (3), and effective treatments and prevention (3). Other single responses were feed intake suppression, triggers of RGS, pathophysiology, developing 'un-infected' ryegrass cultivars, and tools to correlate visual symptoms with sub-clinical effects.

The topics on which more research was requested were: the sub-clinical effects of ryegrass endophyte (3 responses), effective treatments (2), other ways to ensure ryegrass persistence (2), means of diagnosing and defining disorders better (2), the economics (1), a means of ranking degree of challenge (1), and an antidote (preferably slow-release) (1).

Discussion

The North Island's East Coast is reputed to be one of the worst regions in the country for RGS. This opinion has probably been based on severe outbreaks in the past in this region, and confirmed by Shortridge (1982), who found RGS was the most prevalent disease in cattle in the Hastings district, and the third most prevalent in sheep. This survey suggests that just as many farms are affected by ryegrass endophyte in Waikato, and just as severely (Figure 1).

There has been an apparent increase in the incidence of RGS in Manawatu and Waikato, but not on the East Coast. This could be due to the higher level of awareness on the East Coast as a result of severe outbreaks in the 1980s, which has led farmers to change management to avoid RGS symptoms. The direct changes have included:

- establishing non-ryegrass pasture species.
- using endophyte-free ryegrass cultivars.
- growing more summer greenfeed crops.
- moving stock more regularly in autumn.
- priority allocation of safer pastures to susceptible stock.

Drought management strategies that have indirectly helped avoid RGS include selling trading stock earlier in spring and reducing the number of lambs held over summer, reducing stock numbers earlier in droughts, and feeding silage during droughts.

There has probably been a higher rate of pasture renewal in the Waikato and Manawatu due to farming enterprises (e.g., dairying) receiving better returns. Most of this renewal has been done with high (>70%) endophyte perennial ryegrass seed, as a result of heavy promotion from seed companies.

Although 41% of veterinarian's clients have endophyte disorders on their farms, only a small amount of veterinarians' time (0–10%) is spent addressing these problems. The survey indicates that this is most likely because farmers consider that there is no prevention or cure for RGS, so there is no point in asking a veterinarian for solutions, and they try to live with the disorder.

Nutrimol™ is a common remedy. The use of Nutrimol™ is supported by McKenzie (1982) and by McKenzie and Everest (1985), but contradicted by MAF (1983 and 1984) where no beneficial effect was shown.

The worst years recalled for RGS were 1999 and 1998, but diminishing memories over time may have influenced this. The summers of 1998 and 1999 were certainly hotter than normal, and very dry in at least one of those years in each region. There were no public warnings that the weather and pasture conditions were conducive to causing RGS (as there is with facial eczema in most regions).

Veterinarians seem concerned about the sub-clinical effects of ryegrass endophyte on animal production and reproduction, and want more information. They also want more diagnostic tools for both clinical and sub-clinical disorders.

Recommendations for the future

This paper highlights several key observations and recommendations;

- Veterinarians should be encouraged to take more of a role in assisting clients to prevent RGS disorders rather than just providing remedies. This could be achieved through awareness and education, and the survey suggests they are receptive to information on ryegrass endophyte.
- Changes in farm management practices in drought regions seem to have had an effect on the occurrence of RGS outbreaks. These practices should be studied

further and promoted to farmers and their advisers.

- Farmers in the Manawatu and Waikato regions have not adopted drought management practices, and as recent seasons have be hotter and drier, they are experiencing more problems associated with ryegrass endophyte. Solutions such as novel endophyte may be very important in these regions.

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