

# Consolidated summary of key points from the Ryegrass Endophyte Symposium: a farm consultant’s perspective

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## Background on endophytes

Endophyte is a fungus, which exists inside individual ryegrass plants, and reproduces through infecting ryegrass seed.

Endophytes are very widespread in New Zealand pastures, being present in 70% of ryegrass tillers in Southland, and 99% in the upper North Island.

The presence of endophyte confers benefits to the host ryegrass plant, inhibiting its susceptibility to grazing by:

- domestic animals.
- above ground insects, particularly.
  - (a) Argentine stem weevil
  - (b) Black beetles
  - (c) Mealy bug.

General awareness of its existence, and understanding of its role, began in the 1980s, and is still expanding. Knowledge of its existence and impacts now allow us to better explain the reasons for “inexplicable” results from scientific trials before 1980. It may also be a prime cause of summer “ill thrift”.

The endophyte responsible for ryegrass staggers in cattle, sheep, deer and horses occurs in perennial ryegrass and some hybrid ryegrass plants. Endophytes that have toxic effects on grazing animals also occur in other grass species, for example, the endophyte in roadside tall fescue that causes “fescue foot”. However, commercial cultivars of tall fescue sold in New Zealand do not contain toxic endophyte.

## Wild-type endophyte

Naturally occurring endophytes are commonly termed “wild” endophytes, while selected strains, which do not contain all the normal toxins, are called “novel” endophytes.

The three main known toxins produced by endophyte are;

Name	Effect
Peramine	Insect resistance
Lolitrein B	Ryegrass staggers (RGS)
Ergovaline	Heat stress Reduced prolactin Enhances impact of Lol.B on RGS

Other minor compounds have been identified but as yet their effects are not fully understood.

## Occurrence

Highest toxin concentrations are in the plant base, reproductive stem, and seed.

Toxin levels vary:

- semi-independently of one another
- through the year
- distribution through the plant

Affected by:

- plant stage of growth
- Nitrogen
- water stress.

## Effects of wild-type endophyte

- Inhibits companion clover growth.
- Reduces the voluntary intake of grazing animals, particularly sheep, horses and deer.
- May impact on animal reproductive performance.
- Causes ryegrass staggers (RGS). Lolitrein B is the principle toxin involved but RGS may be further compounded by the presence of ergovaline.
- Responsible for heat stress (ergovaline), which has a consequent impact on animal production.
- May reduce milk production.
- It appears dairy cows are less susceptible, perhaps due to years of selective breeding for high milk production on endophyte-infected pastures.
- Also causes increased dags and flystrike in sheep.

Variation exists between individual animals for susceptibility to RGS, which means it can be selected for. There is good correlation between sheep lines selected for resistance to ryegrass staggers, and resistance to facial eczema.

Impact of endophyte can be quite catastrophic on individual properties and sheep flocks, with significant stock losses due to ryegrass staggers, and production losses.

## Research

Scientists are doing some very clever work to better understand the various endophyte components and actions so that they can use the knowledge to develop solutions. Some examples include research on:

- a better understanding of how and why the toxins impact on animal physiology
- the chemical, genetic and molecular structure of endophytes
- the relationship with the host (ryegrass) plant.

Scientists believe there are other compounds and toxins within the endophyte fungus. Much of this work is beyond the comprehension and understanding of “mere mortals” (consultants and farmers), but I look forward to the ultimate solutions which result!

## Solutions

There are no drugs and chemicals that are effective in preventing or overcoming the impact endophyte toxins have on grazing animals. Therefore need to prevent the problem occurring.

One solution is to find endophytes that provide insect protection, but do not affect the animals or the host plant (novel endophytes).

The first attempt (Grasslands Pacific Endosafe), showed this is not a straightforward process. The experience with Endosafe demonstrated the need to develop and use a screening process for finding possible “non-toxic” endophytes, and then undertaking a comprehensive testing programme under all combinations of cultivars, animal species, and climate soil combinations.

This is not a simple process. There are a large number of inter-related factors, not all of which are known or understood.

The results from screening various endophyte selections have resulted in some variation in results, but AR1 is looking very promising.

Currently, AR1 is being bulked up in selected cultivars by seed companies. At the same time, AgResearch is undertaking animal grazing trials throughout the country with each of those cultivars, to check for effectiveness in providing insect protection, without associated animal performance problems. If results prove satisfactory, then AR1 infected cultivars will be commercially released, but not before 2001 at the earliest.

Any commercial release will come bundled with an extensive technology transfer programme, aimed at providing farmers with an understanding of how to establish and maintain novel endophyte pastures.

## Problems

Establishing and maintaining an endophyte free/novel pasture is not easy. There are problems from:

- vegetative regrowth from the old pasture.
- wild-type endophyte being transferred in through seed carried by animals (externally and through the gut).
- contamination from existing seed bank in soil.

However, there are management practices that are effective in minimising the problems. Primarily, it involves understanding of the issues, and sufficient forward planning.

