Facing up to Facial ECZEMA

Foreword

"More profit from sheep" is the motto of the New Zealand Sheep Council.

When facial eczema (FE) is rampant in your sheep, even a little profit will be impossible to achieve. Sheep showing symptoms of FE are obviously not performing well, but less obvious to many farmers are the devastating effects of sub-clinical FE.

Prevention is the only way to lessen the impact of FE, since there is no cure for it yet.

With FE widespread again this year, the Northern Region Sheep Council felt it was necessary to update the publication Facing up to FE. This publication was issued by the National Sheep Council in 1991, and is out of print. The task was given to me, and this booklet is the result. Much of the original text has been retained.

It is the hope of both North Island Sheep Councils and the advertisers, that this booklet will be used as a reference in the future.

I am grateful for the help and cooperation that I received from Dr. Neale Towers of AgResearch and Kees Wesselink of *Ramguard.*

Edward Dinger

Member, Northern Region Sheep Council.
June 1999.

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The aim of the Sheep Council is greater profit from sheep through improved genetics and farm management practices. The council is owned and controlled by farmers. The membership includes breeders and commercial farmers, representatives of Wool*Pro* and Meat New Zealand. It is funded through meat and wool levies.

Sheep Council
More Profit from Sheep

meat NEW ZEALAND WOOLPRO
Partners in our farming future

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Summary

1. Facial eczema (FE) is caused by spores of a fungus in the base of the sward. They release a toxin which attacks the liver. It is a serious disease that affects sheep and cattle and can be fatal.

2. Your losses are much greater than they appear. FE, when no symptoms are visible, can reduce lifetime productivity by up to 25 per cent.

3. There are practical ways in which you can reduce your losses. You should use two or three methods together.

4. Breeding for increased tolerance to FE should be your first line of defence. Buying FE-tolerant rams will make a great difference in only a few years - but you have to be consistent in only bringing tolerant rams into your flock.

5. You can give all or part of your flock a zinc bolus, which lasts 6 weeks, or dose with zinc oxide weekly or fortnightly to reduce liver damage. For large numbers, you can spray zinc on pasture.

6. Quit stock early, build up feed reserves, and aim for light rotational grazing.

7. Most vet clinics have a spore counting service. If one is not available, get together with other farmers and organise a spore counting service (persuade your vet clinic to offer the service, hire someone to do the counts). Spore counts will help you identify the safer parts of the farm (the shady, windy places).

8. Fungicide sprayed before the onset of FE season will reduce spore counts for 5 to 6 weeks. Use these pastures for your replacement ewe lambs and hoggets.

9. Aim to be lightly stocked through the danger period.

10. Neighbouring farmers should get together to share knowledge and hear advisers.

11. Don't relax precautions too soon - a few cool nights or heavy rain doesn't mean danger has passed. Once spore counts rise, pastures remain toxic until the spores disappear.

12. Facial spore counting offers a method of determining how much challenge has occurred to the animals.

Progress through research and working together

Scientists continue to search for easier and more effective ways to combat FE. Safer pastures are being developed. A biological control system based on spreading spores of non-toxic strains of the fungus that causes FE is being tested. This has been very effective in small scale trials - now the challenge is to develop ways of growing and spreading large volumes of fungal inoculum cheaply enough to make it economically viable.

Considerable effort is being directed at developing cheaper and safer ways of identifying FE tolerant rams using DNA markers.

Work to identify the genes involved in FE tolerance or susceptibility in sheep has made considerable progress.

While research continues, there is already enough knowledge to greatly reduce the damage caused by FE. The members of the Sheep Council hope this booklet will provide more of that knowledge and encourage more dialogue about the problem.

Neighbouring properties may have a lot in common when FE is rife and there is much to be gained by working together. You might set up a local discussion group and bring in speakers or consultants. Work together to get a spore counting service for your district - persuade your vet clinic to provide a service or club together to buy a microscope and set up a local spore counting service. Details of the spore counting technique can be obtained from AgResearch.

If you have further questions, talk to your vet, AgResearch or one of the Wool*Pro* extension specialists.

Read AgFacts 135 to 139 for more information on FE - these are available from AgResearch or can be found on the Internet at http://www.agresearch.cri.nz in the section titled Publications. Also read *R&D Briefs* summaries of results from Meat New Zealand-funded research projects for FE.

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Meat New Zealand R&D
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http://www.meatnz.co.nz

The nature of the problem

Facial eczema is very costly - and very difficult to pin down.

As farmers know, it comes and goes. You make all the mental resolutions and preparations to cope with it . . . and nothing happens. Then some years later it almost wipes you out.

It is also a hidden killer. You see only a few sheep with the symptoms, but then you have a barren ewe problem, deaths at lambing, ewes that run dry before weaning. You don't connect these with FE, but for every clinical (or obvious) case, there can be five, 10 or more with the disease. That is the nature of the FE problem - it is hard to know if you have one.

If you farm in the North Island you probably do. And it is costing you, on average, hundreds or thousands of dollars a year. In the 1981 outbreak, the cost of lost production to New Zealand was estimated to be $58.4 million dollars (Smith and Towers).

Many farmers know this but are turning a blind eye. This booklet has been published by the Sheep Council to get across a message:

- That there are economical means to cut your FE losses.
- That you have a range of options so you can choose those which are best for your farm.
- That they don't have to cost you a fortune or involve extravagant labour.

The cause and the cost

Facial eczema is caused by the spores of a fungus, *Pithomyces chartarum*, which lives in the base of the pasture. Swallowed by sheep, the spores release a toxin which can cause severe injury to the liver and bile ducts. In some animals the bile ducts may become partly or completely blocked. When this happens bile and other waste products will build up in the bloodstream causing sensitivity to light.

The symptoms of FE can be distressing
But not all animals with FE show clinical symptoms.

The fungus is very common. It is found all around the world, but nowhere does it cause such severe problems as in New Zealand.

It is always in the pasture, and the sheep are always ingesting it in small quantities. Then, when temperatures and moisture levels are high, and soil night temperatures remain over 12 to 13 deg C, the conditions are right. The fungus suddenly goes on the rampage, growing rapidly and producing vast numbers of toxic spores.

Each rise in spore numbers provides the starting point for the next period of rapid growth and after two or three 'danger' periods spore numbers are high enough to threaten animal health.

While spore counts of 80-100,000 are often spoken of as the 'danger level', stock grazing pasture with 40,000 spores per gram of grass for long periods are likely to develop facial eczema.

The symptoms of FE are distressing: restlessness followed by shaking and rubbing heads against posts and gates, avoiding direct sunlight, then drooping and reddened ears and swollen eyes. These and other exposed areas develop a weeping dermatitis and scabby skin, affected areas may become infected or fly blown.

Not all animals with FE damaged livers will show these clinical symptoms - in fact, except in very severe outbreaks, most animals with FE liver damage will show no outward signs at all. A blood test - the GGT test - can be used to detect liver damage in these animals.

Death rates and animal stress can be high. In some areas, farmers have lost up to 70 per cent of their hoggets. A loss of 20 per cent of lambs is common.

Facial eczema lowers the immunity system and may increase susceptibility to other diseases.

Sheath, Webby & Boom state, in a paper published by the New Zealand Society of Animal Production:

``A facial eczema outbreak causing moderate liver damage in a flock may result in very few ewes showing clinical signs of the disease, yet numerous trials have shown that the following effects can be expected:

- Reduced fertility and fecundity.
- The lifetime production of hoggets will be reduced.
- Reduced growth rate in affected lambs and hoggets.
- Increased culling. The proportion of ewes culled or barren can be 12 per cent higher in affected ewes than in unaffected ewes.

All these losses can be suffered in a flock which only shows a handful of clinical cases."

"Farmers judge a bad FE year by the number of 'clinicals' or animal with visible symptoms. But the greater concern is the number of sub-clinicals, since this is liver damage that is not visible.

"If you get, say, 5 per cent clinicals, then at least 50 per cent of the flock has sub-clinical FE. With 20 per cent clinicals, the whole flock will be affected," says former Whatawhata scientist Dr Clive Dalton.

Planning your campaign

1. Start by considering the options and which of them, or a combination of them, may be suitable for your property. The options are:

- Breeding an FE-tolerant flock by buying rams from a FE-tolerant ram breeder (a list of ram breeders is at the back of this booklet, and is also available from AgResearch-*Ramguard*, Ruakura).
- Dosing your most important stock with zinc, either by using the Time Capsule® zinc bolus, drenching with zinc oxide, or spraying pasture with zinc oxide.
- Growing a forage crop.
- Using fungicides to provide safer grazing.
- Lowering your stocking rate at vulnerable times.
- Use of alternative pasture species.

2. Get the expertise

- Check up on breeders offering FE-tolerant rams that are suited to your main breeding requirements.
- Learn how to collect and count spores. Otherwise send grass samples to your nearest spore counting service. Most vet-clinics offer spore count services.
- Use spore counts to identify the safe paddocks on your farm.
- Bone up on the use of a fungicide and zinc.

3. Don't get caught short

- Buy your stocks of zinc boluses, zinc oxide or fungicide early - in bad FE seasons shortages are common and you may not be able to get supplies when you need them.
- Don't relax precautions too soon - a few cool nights, or heavy rain, does not mean the risk of FE is over. Once spore counts rise pastures remain toxic until the spores disappear. Check spore counts before you relax.

Breeding for FE tolerance

Among the choices you have in facing up to FE, breeding comes first. It is a permanent gain, adding value to your flock and making the other annual precautions easier and less critical.

It does not involve a great labour input and it is not affected by the difficult contours of your property. Genes can go anywhere!

There are tests to identify the most tolerant rams in a flock. Each ram passes on about 40 per cent of his "talent" to his offspring.

What difference does it make?

In breeding terms, progress is relatively rapid and significant gains will be made in only a few years of concentrated selection.

Ram breeders using the *Ramguard* FE Tolerance Testing Service provided by AgResearch have on average multiplied the base tolerance level of their flocks two to threefold after eight to nine years of breeding. A few breeders who have used the service for more than 12 years have increased tolerance levels about four-fold. This means they can safely graze pastures with spore counts much higher than they could previously, but it does not mean they are now resistant to all dangerous pasture.

Healthy liver (right) and FE-damaged liver
Ramguard performance testing ranks rams on their ability to withstand a challenge with sporidesmin, the fungal toxin that causes FE.

Commercial sheep farmers can rapidly increase the FE tolerance level of their flocks by buying rams from these breeders.

The practical results of breeding for FE tolerance can be seen from two facial eczema outbreaks among the Ruakura flocks.

In January 1989, lambs from the tolerant and control (no selection for FE tolerance) flocks were run on toxic pasture with an average spore count of 400,000. The results of a blood test for FE liver damage 14 days later showed that the tolerant group had no liver damage and the control group all had liver damage.

The control animals were removed from the toxic pasture and the tolerant lambs stayed on another 14 days. Ten weeks later:

- Tolerant group - 38 per cent clinical FE; 23 per cent dead.
- Control group - 100 per cent clinical FE; 93 per cent dead.

In April 1990, 160 FE tolerant hoggets and 110 control hoggets were tested for liver damage after grazing on pastures with low to moderate spore counts since January.

- Tolerant flock - only 20 per cent had any liver damage and this was generally minor.
- Control flock - 76 per cent had minor or moderate liver damage.

Continued selection for tolerance means that the difference between the flocks is even bigger now.

Breeding rams

If you are a ram breeder, you should make selecting for FE tolerance a major breeding goal. That means you should begin testing potential flock sires for FE tolerance.

Breeding tolerant rams is a long-term commitment that will involve considerable expense. You should therefore have clear ideas of why you are doing so, and what your overall selection priorities will be. *Ramguard* can help you make these decisions.

You will find the *Ramguard* performance test described below. It ranks the rams in your flock, and is not a basis for comparison with other flocks. It will cost approximate $150 to test each ram.

The performance test

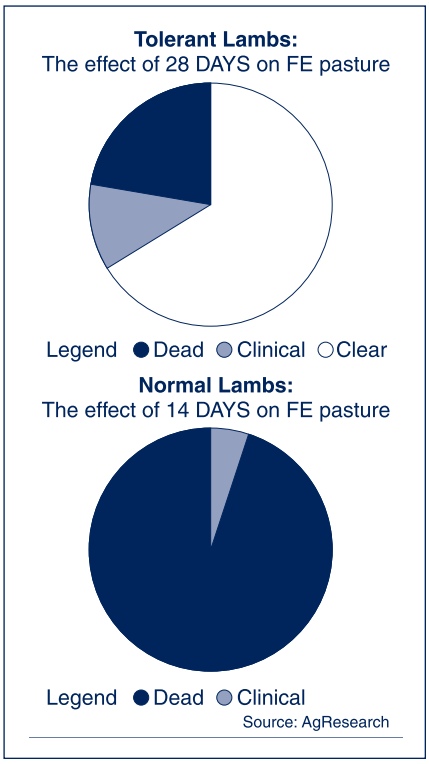
This test ranks your rams on their ability to withstand a challenge with sporidesmin, the fungal toxin causing FE. Potential flock sires are dosed with small amounts of toxin. If this causes liver damage, an enzyme known as gamma glutamyl transferase (GGT) leaks from the damaged tissue into the blood. By measuring the GGT, the laboratory can detect liver damage when there are no outward signs of FE.

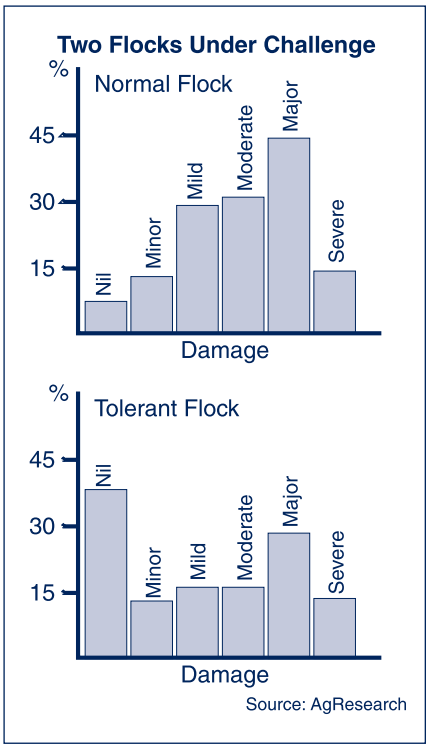
In most tests, a first round with a low dose of toxin identifies the most susceptible rams, a second round with a larger dose sorts out the more resistant rams - these are the rams that have not reacted to either toxin dose.

The whole process takes about two months. *Ramguard* provides the sporidesmin, organises the blood testing and a report on the ranking of each ram; your local vet normally doses the rams and collects the blood samples for testing.

Ramguard provides each breeder with a certified copy of their results each year and a history of their testing programme for display to ram buyers as evidence of their commitment to breeding FE tolerant flocks. Records of the results are kept on file and used to select the toxin dose rates for the following year's tests.

A less accurate way of ranking of the ram team is to gather blood samples after the FE season for a GGT test. Rams with the highest GGT values are the most susceptible and should be culled. Similarly you could have your replacement ewe hoggets tested for GGT levels and cull accordingly.





When a flock is hit by FE, not all animals are affected to the same extent, but breeding for tolerance makes a big difference overall.

Buying rams

If you buy in your rams, you should buy from breeders who are selecting for FE tolerance and have sheep suited to your type of country.

If your current breeders are not testing for FE tolerance, you should persuade them to start or, if you want rapid improvement, change to a breeder who is.

The breeder may ask for a premium for tested FE-tolerant rams; testing costs money and the breeder needs to recover some of these costs, but in general rams from a tested flock do not cost more than rams from susceptible flocks.

It is not sufficient to hear the breeders say they are testing for FE tolerance. You have to know about their programmes and you have to be sure that the rams you buy share the tolerance that has been developed.

That will depend on:

- The size of the flock and the percentage of the sheep the breeder is testing.
- How long they have been selecting for FE tolerance. Ask for the FE certificate, issued by *Ramguard.* (The dose rate should be increasing.)
- Whether the sires used are the top 5, 10, 20 or 50 per cent of the tested rams. A breeder using only the top 5 per cent will make much faster progress than one selecting from the top 50 per cent.

When selecting a breeder there are a number of questions you should ask about the breeding programme that will show whether breeding for FE tolerance is a priority, and how well the breeder is doing the job - see the next article on the *Ramguard* FE Tolerance Testing Service for details.

How well a breeder is selecting for FE tolerance is more important than how long the breeder has been testing. A new breeder testing a large number of rams and only using the most tolerant will quickly overtake a breeder who tests only a few rams or uses rams lower on the tolerance ranking list.

FE tolerance does not affect the other traits, so you can continue to look for higher growth rates or heavier fleece weights (for example) while pursuing your FE programme.

Stick with the chosen breeder

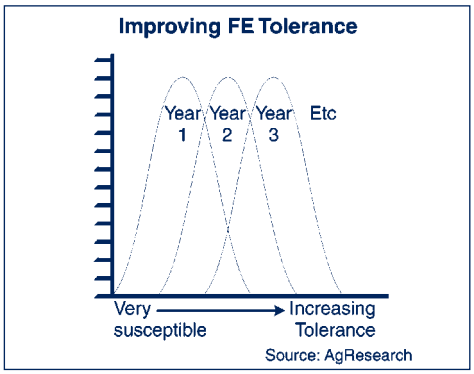
Having found a breeder in whom you have confidence, stick with him. The breeder will retain the best animals for his own flock and will continue to make genetic gains. His clients will make parallel gains about two seasons behind.

Consistency is the name of the game. If you buy rams, or other susceptible stock, from untested flocks, you could lose all the hard-won gains from breeding or buying FE tolerant rams.

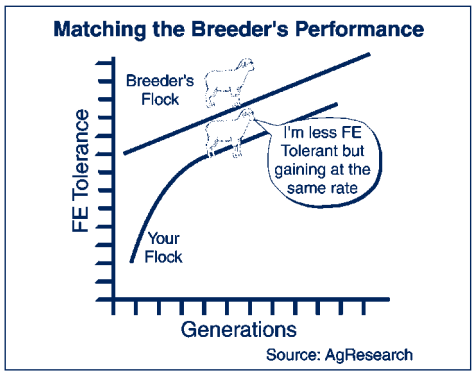
One of the advantages of buying FE tolerant rams and breeding for tolerance is the increase in your lambing percentage as the effects of FE are overcome. At 130 per cent lambing or more, half your ewe flock can be put to a fast growing terminal sire so you get more lambs away before the onset of the FE season. The reduced stocking rate will make it easier to manage through the FE season.

Natural tolerance to facial eczema

Since the release of the Finn sheep from quarantine into New Zealand in 1990 evidence has grown of this breed's higher natural tolerance to facial eczema. A paper published in 1994 (Morris et al, Susceptibility of Finnish landrace, Romney and Finn x Romney lambs to a sporidesmin challenge, New Zealand Journal of Agricultural Research 1994, Vol 37: 547-552) outlined a trial where purebred Finns were mated to some tolerance-selected Romneys and some non-selected Romneys. The resultant crosses (FxF, FxR and RxR (both tolerant and non-selected lines)) were given a standard sporidesmin challenge (0.15 mg/kg) and then compared by serum GGT levels.



The bell curve represents the normal range of tolerance in a flock. With a breeding programme, it should advance 2.5-3.5 per cent each year.



When you buy consistently from a ram breeder, you make the same progress, but about two seasons behind.

This experiment showed that there were proportionally about three times as many FxF as RxR lambs tolerant to a high sporidesmin dose and that FxR lambs were approximately intermediate between FxF and RxR in numbers tolerant. This apparently confirms the anecdotal evidence that the Finn breed has a higher natural tolerance than Romneys to facial eczema.

However the use of the Finn in commercial sheep flocks is more likely to be that as a crossbred, so the FE tolerance status of the other breeds must be taken into account when selecting those animals for FE tolerance. If the other breeds used in the cross have come from flocks that have been breeding for FE tolerance then the FE resistance status is likely to be maintained.

If however the background of the crosses have had no tolerance selection then any advantage from the Finn (or any tolerant bred stock) will be reduced and may even be completely lost. If the Finn only makes up one-eighth of the crossbred it will only have one-eighth of the Finn advantage in FE tolerance, and this is unlikely to be significant.

Currently the use of rams from flocks that have been tested with sporidesmin is the only certain way to ensure that a ram will pass FE tolerance on to its progeny.

Ramguard FE tolerance testing service

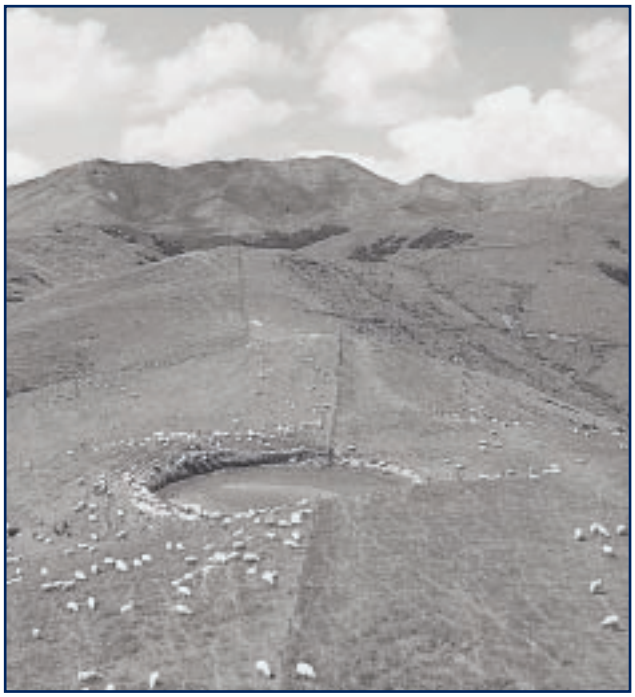
By Kees Wesselink, AgResearch Ruakura

Facial eczema (FE) has been the curse of farming in many parts of the North Island for over 60 years. But, thanks to the work done at the Ruakura Animal Research Station since 1975 and with the help of farm consultants and some experienced sheep breeders, a solution to the problem of FE has come a lot closer.

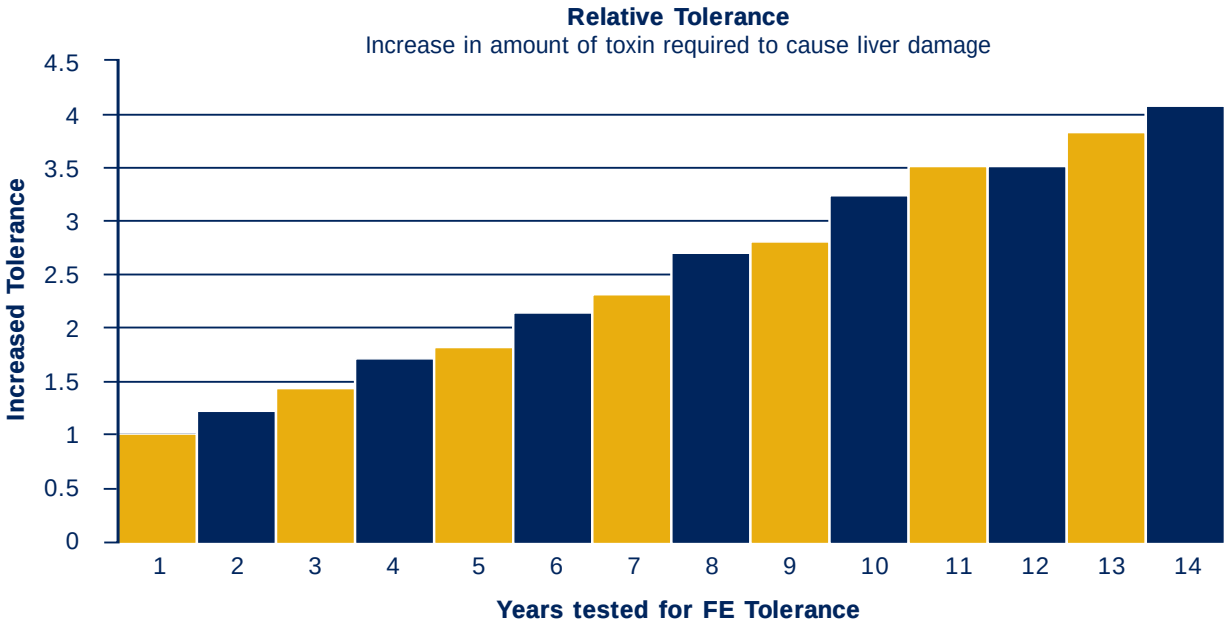
In the mid-seventies it was realised that FE tolerance was strongly heritable, and procedures were developed to identify tolerant sires by challenging them with a measured quantity of sporidesmin, the toxin that causes FE. Reactions to the challenge were measured by analysing a blood sample, taken 21 days after the challenge, for GGT levels. Blood GGT levels increase in proportion to the amount of facial eczema liver damage each animal suffers. The most tolerant animals have no, or the lowest, increases in blood GGT concentrations. A successful test shows a range of values that allow us to rank the animals from the most tolerant to the most susceptible.

To prove that this procedure works, a demonstration flock was established at Ruakura and rams from the flock were tested each year using the *Ramguard* service. The most tolerant animals were retained for breeding, and the following year their progeny were tested and again the most tolerant animals kept as sires. After 20 years of breeding the flock is still getting more tolerant and there is no suggestion that progress is slowing. Most importantly, selection for facial eczema tolerance has no adverse effect on other productive traits such as ewe fertility or wool weights. Instead we have found that FE-tolerant sheep appear to be more resistant to ryegrass staggers.

This procedure has now been used successfully in the ram breeding industry for many years. Breeders who have used the *Ramguard* FE Tolerance Testing Service for the last 10 years have trebled the FE tolerance level in their flock. Those that have been testing for 15 years now have flocks that need a challenge up to 4.5 times higher than the base level to identify their most tolerant rams. (The base level is the initial level of challenge required to give a reaction to the toxin in an untested flock.)



Stick with the breeder you trust
Improvement won't be immediate, but it will be permanent.



Breeders who have consistently used the *Ramguard* service have made steady, lasting progress over the years. Although we have not reached the point yet where tolerance levels are high enough to cope with severe seasons like the autumn of 1999 without any FE, the FE-tolerant flocks were much less affected then their neighbours.

Buying your rams from these breeders is the only way to permanently reduce facial eczema problems on your farm. Ram breeders who have made tolerance to facial eczema a priority are listed at the end of this booklet. Further information can be obtained by contacting *Ramguard*, or your nearest Wool*Pro* extension specialist.

Remember that the *Ramguard* FE Tolerance Testing Service is a tool used by ram breeders to identify FE-tolerant rams for use in their own flocks rather than to produce individually tested animals for sale. So don't expect to be able to buy the ram breeders top tested rams, since they should be keeping them to improve their own flocks. However, these rams may be available as 4- or 6-tooth animals after the breeders have used them.

RAMGUARD Facial Eczema Tolerance Testing Service

Facial Eczema Certificate

Flock Testing History for:
Name: R. Ambreeder
Address: Mountview Stud Rd Woolville
Years tested: 15

Year tested	Number of rams tested	Number of tested rams by Untested Sires	Number of rams tolerant to final dose:	Dose rates (mg/kg) used for challenge: 1	2
85	20		4	0.07	0.15
85	23		12	0.07	0.17
87	25		4	0.10	0.26
87	30		5	0.14	0.30
88	29		5	0.20	0.30
89	30		0	0.26	0.31
90	13		2	0.29	-
91	22		9	0.29	-
92	17		10	0.30	-
93	17	0	7	0.32	-
94	11	0	6	0.35	-
95	10	0	6	0.37	-
96	13	0	8	0.40	-
97	13	0	6	0.41	-
98	10	2	1	0.43	-

DECLARATION

1. "I,..Rod Ambreeder, agree to abide by the rules set out for FE certification on" the back of this certificate.
2. I used ..6.... out of ..13.. FE-tested Sires in the 1998 mating.
3. Rams used ranked in the top ..46..% of animals tested. .....100.... out of ...1100.. ewes not mated to FE-tested sires in the 1998 matings.

Signed: **R. Ambreeder**

Date:09-Jun-99

Dose rates can vary from year to year, but in a successful programme the trend is upwards

Dose rates cannot be used to compare tolerance rankings between flocks because the effect of the dose rate is influenced by:
- Previous exposure to toxic FE spores
- The condition of the animals tested
- Animal weight gains and losses
- The age of the animals
- The time between shearing and dosing
- The time of the year the test is done
- The composition of the pasture

When "tested" rams are available for sale, ask to see the test results and make sure that they were among the rams tolerant to the toxin challenge - ie, they "passed" the test.

The advice to "buy FE-tested rams" is thus technically not quite correct. It should be to buy rams from breeders who are testing and using the most tolerant rams as sires in their own flock.

The commercial sheep farmer should also keep in mind that improvement won't be immediate. As with all genetic gain, it is slow but will be permanent.

A description of the performance testing procedure is found earlier in this booklet.

So when you, the commercial sheep farmer, are off to buy your rams from a breeder who claims to have FE-tolerant sheep, there are some questions you should be asking.

Here are a few pointers:

•Ask whether the breeders used the Ramguard FE Tolerance Testing Service

Ramguard offers the only FE Tolerance Testing Service, and selecting for tolerance without using the service is extremely difficult. Breeders not

using the service are unlikely to have made any significant progress.

• *If the breeder is using the Ramguard service, ask for the Ramguard FE Testing Certificate*

The certificate contains the testing history of the breeder, and all reputable breeders will be happy to make it available. (See page 10.)

• *Check number of years the breeder has been testing*

The more the better. So long as they have tested sufficient rams and have not introduced untested sires into their flock, the more years the breeder has tested the more progress they will have made.

•*Has the breeder introduced non-tested sires into the flock?*

Introducing untested rams may slow or even reverse progress in selecting for FE tolerance.

•*Compare starting dose rates with current dose rates*

RAMGUARD Facial Eczema Tolerance Testing Service

FINAL RESULT SHEET

Breeder: F.E. Tolram
Veterinarian: D.R. Acula
No of years tested: 13
Relative dose rate: 1st dose: base dose x 3.7
2nd dose: base dose x 4.1
% Tolerant to final dose: 23%

Base dose is the dose rate used in the first round of testing in an untested flock.

	Ram Tag	Year Born	Sire ID	Sire Tested Yes/No	Dose1 GGT Pre	Dose 2 GGT Day 21	Day 21	Liver Damage	Test Rank
	229	97	421/95	Yes	39	42	43	Nil	1=
	334	97	321/95	Yes	37	38	31	Nil	1=
	358	97	321/95	Yes	33	37	41	Nil	1=
	406	97	185/95	Yes	39	42	60	Slight	4
5	428	97	119/95	Yes	41	37	79	Slight	5
	255	97	421/95	Yes	36	43	99	Slight	6
	102	97	119/95	Yes	35	36	135	Slight	7
	42	97	119/95	Yes	44	48	251	Moderate	8
	226	97	185/95	Yes	36	44	320	Moderate	9
10	34	97	7071/93	No	33	39	1086	Severe	10
	264	97	321/95	Yes	40	69	no 2nd dose	Slight	11
	301	97	7071/93	No	36	417	no 2nd dose	Moderate	12
	29	97	7071/93	No	32	1444	no 2nd dose	Severe	13

TEST RANK: Where the animal ranked out of **13** animals tested

GGT levels: Liver damage:
<55: Nil
55-199: Slight
200-499: Moderate
> 500: Severe

Kees Wesselink
Date:24-Jun-98

Ramguard **- Ruakura.**

If, for example, the starting dose rate was 0.1 and the current dose rate is 0.35, non-reactors at 0.35 are at least 3.5 times more tolerant than those that reacted at 0.1. (See Graph, page 9.)

• *How many animals are tested each year?*

The more the better, as this can allow a greater selection pressure to be applied.

• *How many animals were tolerant to the test?*

The lower the number of tolerant animals, the higher the selection pressure. In tests where the sporidesmin challenge is too low, most of the rams will not react to the toxin and only the most susceptible will be identified. It will not be possible to separate the 'top' animals from the 'average' animals.

•*Check that the rams you are buying are the progeny of sires tolerant to the test and not of "tested" sires kept because they scored highly for other productive traits*

Not all "tested" sires are tolerant to the sporidesmin challenge used - in fact the test is designed so that about two thirds "fail", otherwise no selection progress would be made. Every breeder has a test result sheet showing the testing history of each sire. Ask for it. (See page 11.)

•*Stick with the breeder in whom you have confidence. Breeders will retain the best animals for their own flocks and will continue to make genetic gain at 2.5 per cent a year. Their clients will make parallel gains about two seasons behind*

•*Your ram breeder is responsible for 85 per cent of the genetic gain that you as sheep farmer can make.*

For more information, contact:

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Zinc for protection

Dosing with zinc

You can protect sheep by dosing with zinc salts. Zinc works because the zinc reacts with sporidesmin, the toxin causing FE, making the sporidesmin "unavailable" to cause the liver cell damage and bile duct blockage that leads to FE.

You have to start early so that the zinc is in the system before the spores are eaten. In most districts that means early to mid-January - but don't start too early as that increases the risk of zinc toxicity.

Zinc can be given either as the controlled release zinc bolus the Time Capsule®, which provides protection for up to six weeks in sheep, or as a zinc oxide drench. Time Capsules for calves and cattle are also available.

While daily or twice weekly drenching is required for the best protection, dosing with zinc oxide at weekly or fortnightly intervals will give substantial protection, reducing liver damage by about 60 per cent for weekly doses and 50 per cent for fortnightly doses. If drenching fortnightly and spore counts start to increase rapidly during the second week after drenching bring the next drench forward to increase the level of protection.

It may be impractical to drench large flocks, but consider treating your replacement ewe lambs and hoggets as FE can reduce their lifetime lamb production. You may be able to put them in paddocks that are easily mustered and handy to yards.

This is usually at a time when viral pneumonia is a threat, so if you can work quietly with small mobs and dust-free yards, so much the better.

Zinc dosing has a reputation for being difficult and messy but there are now forms available which are easier to handle and the Time Capsule®, although more expensive, is a convenient way to provide long term protection.

Make sure that you use zinc oxide suitable for animal dosing - most of the zinc oxide available has been registered with the Animal Remedies Board and the packaging carries full mixing instructions and the dose rates. Read and follow the instructions carefully - overdosing can lead to zinc toxicity.

Don't get caught out by relaxing precautions too early - a few cool nights, or heavy rain, does not mean the FE season has finished. Once spore counts rise the pastures will remain toxic until the spores disappear, so check the spore count before stopping dosing.

For further information read AgFacts 135, 138 & 139 - these can be obtained by writing to:
AgResearch Ruakura, Private Bag 3123, Hamilton
or found on the Internet at:
http://www.agresearch.cri.nz in the section titled Publications.

Like all FE control methods, zinc is not 100 per cent effective, however often you dose. You still need breeding and grazing management as part of your defences.

Dosage volumes

Without stabilisers

Mix 1 kg zinc oxide to 2.5 litres of water. Dose at the rate of 1 ml/10 kg liveweight x days between drenchings.

Dose interval	Lambs 30 kg	Ewes 60 kg
3-4 days	11 ml	21 ml
1 week	21	42
2 weeks	42	84

With stabilisers

Mix 1 kg zinc oxide plus 200 ml of stabiliser to 1 litre of water. Dose at the rate of 0.5 ml/10 kg liveweight x days between drenchings.

Dose interval	Lambs 30 kg	Ewes 60 kg
3-4 days	5 ml	10.5 ml
1 week	11	21
2 weeks	21	42

Zinc on pasture

This is a low-labour method for dosing large numbers of animals. It requires an area of sprayable land with sufficient pasture to provide grazing for 12 to 24 hours. It works best when the area is small, the pasture moderately long and most of it is eaten. The animals should be confined to the area until the sprayed pasture is eaten.

Any spraying system with a high return flow through the bypass valve is adequate for spraying zinc oxide. If you have a high-pressure hose, you can use it to disperse the powder while filling the tank. (Be sure to put a piece of timber over the pump inlet first to prevent blocking.)

Dose rates should be adjusted to compensate for changes in the pasture utilisation. On shorter autumn pastures, the rate would be 30 to 35 per cent. If the rate is not measured, assume 30 per cent.

The table shows the amount of zinc oxide to use for various classes of sheep on a weekly routine.

For example: 500 lambs (30 kg) at 30 per cent utilisation would be 15 g x 500 = 7.5 kg of zinc oxide.

Weekly spraying

% Pasture utilisation	Dose rate (Grams of Zinc per 10 kg liveweight)	Lamb 30 kg	Ewe 60 kg
20	6.0	18.0	36
30	5.0	15.0	30
40	4.0	12.0	20
50	3.5	10.5	21
60	3.1	9.5	19

Zinc does not affect pasture growth but its effects on the ecosystem are not well understood. Sheep should be removed from zinc dosing programmes a week prior to slaughter.

Management of pastures and grazing

Pasture and grazing management will reduce FE risks: start your planning early.

This section has two parts. The first deals with the lessons about pasture species and grazing management learnt from the FE outbreaks in the North Island in 1938. It has been prepared by Reg Keogh, Grasslands scientist, AgResearch.

The second part examines grazing strategies to reduce FE risk for hill country areas. This is largely based on trials at a Gisborne farm and Whatawhata Research Station, reported by Dr Neale Towers, AgResearch, Ruakura.

FE outbreaks - lessons from 1938 disaster

The main findings of extensive investigations following the widespread FE outbreaks in North Island regions in 1938 can be summarised in this quote: "In localities where the disease occurs the outbreaks are most severe on pastures where *perennial ryegrass is dominant*, where the pastures have been *closely eaten* and have dried out during a hot, dry period and have flushed rapidly after rain."

And its corollary: "The occurrence of the disease is generally less severe as the dominance of perennial ryegrass in the pasture declines, as the pastures are less closely eaten during dry weather and as the soil conditions do not favour very rapid growth." (Levy & Smallfield 1942).

These findings were made long before it was known that the fungal saprophyte, *Pithomyces chartarum*, was the organism that produced the liver toxins responsible for FE. Subsequent research has confirmed the validity of the conclusions reached by Levy and Smallfield and extended our understanding of the roles of pasture species and grazing management in the development and control of FE.

PASTURE SPECIES AND GRAZING MANAGEMENT

FE can be controlled through choice of pasture species and/or grazing management (more detail is in Meat New Zealand *R&D Brief* no. 42).

Pasture species and FE

Chicory, legumes, and tall fescue are able to be used as FE-safe pastures/crops. The legumes include white and red clovers, Lotus species, and other forage legumes such as lucerne, sulla, and sainfoin.

The best control is obtained with crops of chicory, chicory with red and white clovers, or with tall fescue, red and white clover pastures.

Livestock performance is also superior on these crops and/or pastures compared with that on ryegrass-browntop based pastures.

FE risk is highest on pastures containing ryegrass, browntop, cocksfoot, Yorkshire fog, and dogstail grass species. Where your existing pastures contain these grasses and you are not able to replace any with FE-safe species, an option is to over-sow in spring with late-flowering red clovers, and encourage development of red clover-dominance for the summer-autumn period.

Red clover-dominant pastures are a much lower FE risk than grass-dominant pastures. Such pastures can be held in reserve for periods of high FE risk.

Chicory-based crops illustrating lack of litter and the ability to harvest all forage without adversely affecting persistence of the crop.

Tall fescue

Ryegrass

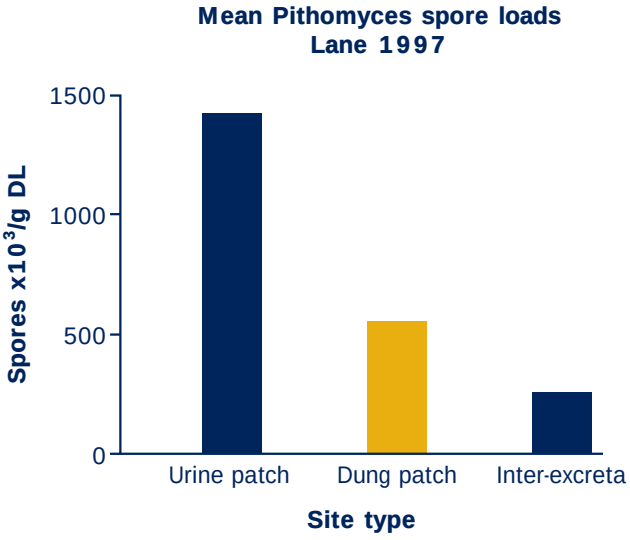
Tall fescue compared with ryegrass-based pastures illustrating major differences in clover content, growth, and amounts of grass litter present.

Grass - dominant pasture showing prominent urine-patch sites.

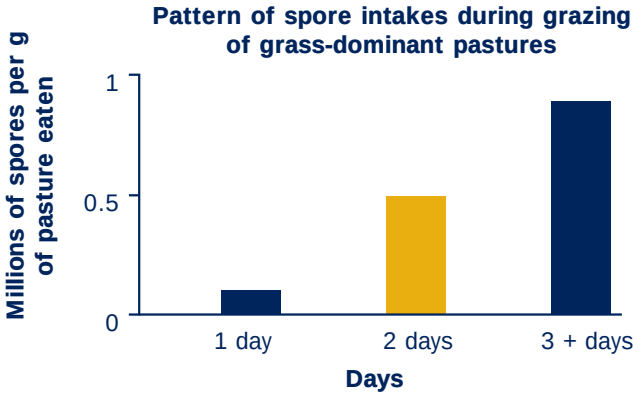
Grass-dominant pastures

Most of our pastures will become grass-dominant as dry periods develop during summer. This is a result of stock grazing out clovers and lack of clover regrowth without adequate soil moisture. These pastures are then a mosaic of dark green urine-patch sites interspersed among straw coloured inter-excreta sites, and ungrazed dung-patch sites.

Livestock prefer to graze pasture at urine-patch sites in grass-dominant pastures and as *Pithomyces* spore loads (spores per unit of pasture) are also often very high at these sites, it follows that stock obtain much of the toxin from here.



The intake of spores (and toxin) increases markedly during the second and subsequent days of grazing.

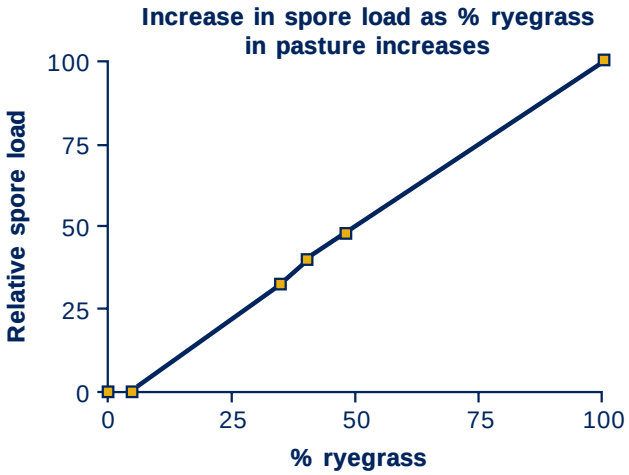


Spore intakes can be kept at a minimum if stock do not get an opportunity to regraze urine-patch sites and this can only be achieved by use of a grazing rotation with daily shifts.

Grass-clover pastures

The presence of clovers influences grazing patterns by making less preferred herbage, such as that at inter-excreta sites, more acceptable. This in turn results in less intense grazing of urine-patch herbage. There are effects on pasture structure and composition, with less litter produced and consequently lower spore loads.

As the proportion of clover increases in a pasture there is a consequent decrease in spore loads. Conversely, spore loads increase as the ryegrass content increases.



PLANNED GRAZING STRATEGIES IN HILL COUNTRY

Planned grazing can substantially reduce the risks of FE in hill country, but the planning should start early. The successful farmer will be the one who dictates what his stock is consuming, and is not simply reacting to situations that develop.

Safer areas within your farm

Generally the safest areas are:

- The shady south-facing slopes.
- Those facing prevailing, drying winds.

Checks by AgResearch at Whatawhata Hill Country Research Station have shown spore counts on easy rolling paddocks and those that face north, can be twice those on the south-facing paddocks.

But remember the lower risk on the cooler, drier slopes is only relative. If the spore count on the sunny face is eight times the danger threshold, it will be four times on the shady slopes (and thus still dangerous).

Fence the safer areas separately, and if possible have sufficient fencing so that you can move sheep, either daily or every second day, on a 10- to 20-day cycle. Use spore counting, watch your newspaper or the notice board of your vet clinic, and listen to the radio for local FE warnings.

Safer pastures

Spore counts are generally lowest on hillsides of low fertility grasses like tall fescue. Summer growing grasses like kikuyu or paspalum also have lower spore counts. Pastures with a high clover, lotus or chicory content are safer than ryegrass dominant pastures.

You will reduce the danger if you encourage clover or avoid ryegrass dominance in summer. Under clover there is less litter, lower temperatures and more moisture.

Risk monitoring

Monitoring is an integral part of risk assessment and the methods used to predict danger periods have included spore trapping, wash counts of pasture samples, and use of climatic data. Another method has been developed based on faecal spore loads and as it relates to what livestock have ingested it gives a better assessment of the current risk.

Faecal monitoring

Ingested spores are not destroyed during passage through the digestive tract and pass through relatively quickly.

The method is simple and easy to use and gives reliable results. Details are available in the Spring 1999 *Number 8 Wired* video on Facial Eczema.

Safer grazing

The first thing is to avoid building up litter in the pasture. Keep pastures under control in spring - it is better to let some pastures build up a feed bank than let all pastures get away. Topping pastures and leaving the litter behind guarantees conditions favourable to FE - if topping, use a silage bucket and remove all clippings. Hay and silage paddocks are generally safer.

The urine patches are favoured by *P. chartarum* fungus because there is a high nitrogen content, more dead leaf from urine scald and a denser, more sheltered environment.

Your best response is to move the sheep on before the pasture - and particularly in these danger spots - is grazed down hard.

While light grazing will reduce the spore intake and the risk of FE, the trouble with it is that you can quickly run out of paddocks, unless the farm stocking rate has been reduced to match the feed available. That could mean not retaining great numbers of young stock over the summer in order to achieve larger carcases.

AgResearch trials have shown that keeping lambs until March puts extra pressure on the breeding ewes and increases the severity of the FE experienced. More ewes die, and those that survive produce fewer lambs the following spring. The costs far outweigh the added return from the six weeks' extra lamb growth.

"The hidden costs of FE were revealed when trials on a Gisborne farm and Whatawhata Research Station were affected by what appeared to be only minor FE outbreaks. Despite there being only two or three clinical cases among the Gisborne ewes, blood tests revealed that two-thirds of the ewes had liver damage, and scanning showed that among those affected, there were more barren ewes and far fewer twins. The more severely affected ewes had only half the number of lambs as those unaffected.

"Worse still, the Whatawhata trial showed that the ill-effects carried through the life of the ewe. The productivity of the flock of ewe hoggets affected by FE was recorded until they were culled for age. Among those affected by FE, there was a higher death rate and lower lambing percentage over the next four years." (Dr. N. Towers, AgResearch, Ruakura)

So in FE prone areas the strategy should be to aim for an early, compact lambing so that you can wean early and then finish the maximum number at good weights. If you are not able to finish your lambs early, then they should be off the farm by the end of February.

Summing up hill country strategies

- Prepare the safer areas of your farm for rotational grazing through the FE risk period.
- Encourage covers in your pastures and consider the advantage of some paddocks of lower fertility grasses. You can build up a feed bank to ease grazing pressure on other parts of the farm.
- Avoid heavy grazing.
- Quit non-capital stock early.

Growing a forage crop

This is another option that allows you to reduce the grazing pressure on possibly toxic pasture. A crop is also useful where other fungal toxin problems, such as ryegrass staggers and zearalenone-induced [*Fusarium*] infertility, are also causing animal health problems and production losses.

If pasture renovation or redevelopment is planned, then a crop may fit into the programme. Use the crop to supplement the most important stock classes (replacement ewe lambs and hoggets).

Fungicide spraying

Apply before spore counts rise
Even then, protection will not be 100 per cent.

Ewe hogget and her lambs
By protecting young stock, you protect their lifetime production.

This is an option that should be considered, especially for valuable animals such as your replacement ewe lambs and hoggets. An FE outbreak among your hoggets will reduce not only their lambing that year but also their lifetime lamb production. And as with a crop, having fungicide spraying will relieve the pressure on other paddocks as you can safely graze these pastures a little harder.

The timing of application is very important. The fungicide does not kill existing fungus and spores; rather it interferes with the germination and growth of the current spores, reducing the production of a new crop of spores.

Fungicides are only effective when applied before spore counts rise. At that stage they can reduce subsequent increases in spore counts by 50 to 60 per cent for four to six weeks. If the fungus is already well established in the pasture, it will continue to germinate active spores and the fungicide will be far less effective. With spore counts over 200,000 per gram, the fungicide won't reduce spores enough to make the pasture safe. FE-treated pastures need to be watched, and spore counts taken.

There are a number of sprays available including Benlate®, Topsin® M4A, Bavistin® DF, Carbendazin®, Delsene® 50 DF, Protek ™.

Don't use orchard type fungicides. Make sure you get complete coverage using a boom sprayer, care in application is the main thing because the volumes are very small and a miscalculation can mean a complete waste. Paddocks should be re-sprayed if there is 25 mm of rain within three days of the first spraying. The pasture is safe to graze after five days.

You should check the pastures periodically to see if they are safe and re-spray until the danger is passed. If you are spraying only part of the farm, you should decide early if you are going to spray additional areas to make sure there is sprayed pasture with good grass cover available at all times.

Lastly, remember that fungicides only reduce spore numbers by about 60 per cent. In extreme conditions, even properly sprayed pastures can still become toxic. This is not a fungicide breakdown - without the fungicide, the pasture would have been very much more toxic and the animal and production losses very much greater.

Mixing instructions and application rates are given on the package labels - read them carefully.

Appendices

1: Protecting cattle

Beef cattle can get facial eczema, but it is not as common. Management is virtually the same as for sheep: watch the spore counts; use safer pastures; don't graze hard; provide supplementary feed; have a concentrated calving and wean early to put replacement stock and any sale calves on the safe pasture; get rid of surplus stock, and spray pasture or use zinc.

Treatment with "the Time Capsule" ruminant zinc bolus or dosing with zinc follows the same lines as for sheep.

Zinc in the water supply

This method of dosing is suitable for cattle only, sheep do not drink enough water to take in enough zinc to provide good protection. There are four main methods of adding zinc sulphate to the drinking water for cattle:

- An in-line dispenser adds a concentrated solution of zinc sulphate to the reticulation system.
- Adding zinc sulphate to a large tank supplying the system.
- Floating trough dispensers. (These may need twice daily checks to refill dispensers and stir the trough to ensure the right concentration.)
- Direct addition to the trough - which will only cope with small numbers of cattle.

Except for the first day or two, cattle will accept the water at the recommended dose rates, so long as they don't have access to untreated water. It is essential that treated water does not get into the household or dairy supply.

Start dosing as soon as warm, humid weather begins. If you are monitoring spore counts, start immediately spore rises begin. Unless spore counts are rising rapidly, start with a quarter dose on Day 1 and increase over 3 - 5 days. The troughs on paddocks that have not been grazed should be primed with zinc sulphate at the rate of 1g per litre.

If possible, avoid dosing for more than 100 days. Overdosing damages the pancreas. Calculate the dose carefully and mix thoroughly. High or irregular doses can occur with direct addition to troughs or with poorly designed dispensers.

Weekly spraying - dry cattle

The amount of zinc oxide to use for various classes of cattle on a weekly routine.

% Pasture utilisation	Dose rate (Grams of Zinc per 100 kg liveweight)	Cows			Heifers		
		350kg	400kg	450kg	215kg	245kg	265kg
20	60	210	240	270	130	150	165
30	50	175	200	225	110	120	135
40	40	140	160	180	85	100	110
50	35	120	140	160	75	85	95
60	31	110	125	140	65	75	85

NB: Not recommended for calves.

In areas where copper and selenium are deficient, supplement with these after the zinc programme - but not during it unless there are clinical deficiencies. For more information contact your veterinarian.

2: Treatment of affected sheep

There is no treatment for the liver damage caused by FE, but you can relieve stress by providing shade, plenty of water, and a low protein diet with no chlorophyll in it (hay or silage) to help the natural healing process.

Zinc dosing should be continued as long as there are spores present, to prevent further liver damage.

Avoid copper supplements (including mineralised drenches) if you expect FE to be a problem. Copper seems to activate sporidesmin toxin in the process of metabolism in the liver.

Supplements of liver stimulants like the vitamin B group, especially B12 might help.

Some animals will appear to recover but lose condition under the strain of pregnancy and lactation, and may die. Culling should be left as late as possible since animals sent away early are condemned because of jaundice.

Sheep with signs of FE should be separated from the flock early. They are very susceptible to flystrike and should be carefully treated for this.