

**FOOTROT AND YOUR SHEEP**

Betty Hall

Footrot serves as an example of how well sheep are "fit" or less "fit" to withstand infection.

- ❖ Merinos are more susceptible than British breeds.
- ❖ Incidence, severity and duration of footrot is greater in purebred than in merinos crossed with British breeds
- ❖ There is a wide individual animal variation within breeds
- ❖ Some strains of sheep are more resistant to infection than others with evidence of genetic resistance which can be selected for, over a long period
- ❖ Susceptibility to footrot is not age dependent-older sheep are as susceptible as young sheep **but** older sheep are harder to treat and less responsive to treatment.

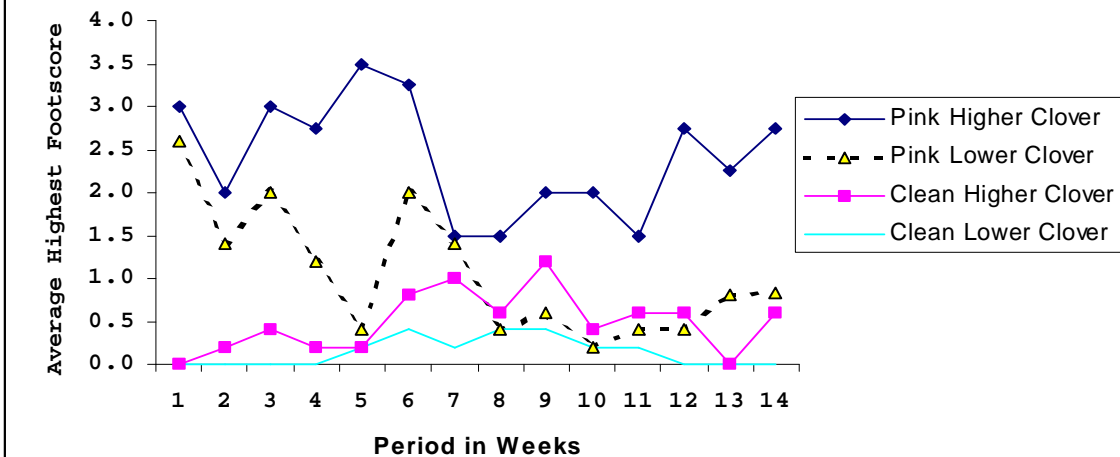
**Older sheep being harder to treat and less responsive to treatment is critical information for anyone undertaking an eradication program. Where these sheep are found to have high score lesions [ $> 3$ ], they need to be seen as high risk and culled.**

Normal, healthy skin is **not** susceptible to infection. Predisposing factors such as water damage, sheep running under consistently wet conditions and temperatures in the order of 10°C provide a suitable environment in the foot. This allows soil and faecal bacteria to invade the inter-digital skin and cause dermatitis creating the perfect environment for the footrot bacteria to thrive.

**If environmental conditions are not conducive for spread of footrot or progression of lesions diagnosis can be very difficult. This requires further assessment after an acceptable spread period. The problem is made more difficult where field benign and low-grade virulent strains are present.**

During the Footrot study on the Cicerone Farm observations were made on the effect of clover content in pasture on the expression of the disease. Graph 1 shows the results for a field benign strain and clean sheep, both of which developed more "severe" lesions on the higher clover plots. This illustrates the point that further investigations have to be made if the environment is not considered supportive of spread and progression of lesions.

Graph 1.  
Pink Tags Field benign-Gel Stable and Clean Sheep  
Cicerone Farm



During the same PIRD study on the Cicerone Farm observations were made as to the effect of foot conformation on the "fitness" or otherwise of Merino sheep to minimise the severity of footrot lesions and the likely hood of spread to clean sheep. The feet of sheep were subjectively assessed into three broad categories, open toes, touching toes or closed toes.

**Results.**

**A.**  
The effect of foot conformation on the progression of footrot lesions in sheep affected by footrot was quite profound as seen in Table 1.

**Table 1.**  
The Effect of Foot Conformation on the Progression of Footrot Lesions.

Footrot score	% of Feet With		
	Open Toes	Touching Toes	Closed Toes
0-2	85%	60%	25%
3a-5	15%	40%	75%

As toes become progressively closer together to the point of overlapping the more the footrot lesion progressed. The production loss due to footrot and the cull rate in these sheep would be higher. Sheep, particularly older sheep, with higher footscores tend to:

- ❖ respond less readily to treatment
- ❖ pose more risk of breakdown
- ❖ need to be culled to reduce risk

**B.**  
The observations made on clean sheep and the effect of foot conformation when introduced into the infected group were also very interesting and important as seen in Table 2.

There was an increased susceptibility of clean sheep to acquire footrot as the toes become progressively closed. The spread rate would increase as well as cull rate in sheep with poor foot conformation.

**TABLE 2**

The Effect of Foot Conformation on the Susceptibility of Clean Sheep to Acquire Footrot.

Footrot score	% of Feet With		
	Open Toes	Touching Toes	Closed Toes
0-2	94%	91%	73%
3a-5	6%	9%	27%

Very little attention has been paid to the Merinos foot in selection programs.

From the results of the Cicerone studies it is clear that selection for an upright foot with open toes will increase the "resistance" of the foot to acquire footrot and if disease is present will limit the progression of the disease.

It may well prove to be a profitable "fitness" trait for studs and commercial producers to select for. Susceptibility to other foot problems such as abscesses, shelly toe, inter digital dermatitis and benign footrot may also be decreased by selection for a sound foot and so improve the "fitness" of the Merino.

## NEMESIS

### *Breeding Sheep for Increased Resistance to Worms*

*Taken from the Nemesis Booklet and a Nemesis Article written by Emma Doyle-CSIRO Chiswick*

Resistant sheep have the ability to keep worm burdens low by reducing the establishment of incoming larvae, slowing down the development of larvae to adult worms, accelerating the rejection of adult worms and reducing the egg laying ability of female worms. Faecal egg count [**FEC**] is the recommended method of assessing worm burdens of sheep. **FEC** is a heritable trait with a heritability of between 0.2 and 0.4. Sheep with below average **FEC** will pass on 25% of this superiority to their offspring.

#### **Selecting for Resistant Sheep**

Individual egg counts are required to determine worm resistance, so that each animal can be compared with their siblings.

#### **FECs must be converted to EBVs**

[**Estimated Breeding Values**] to accurately assess worm resistance.

**EBVs** are appropriate when there is ram or ewe pedigree information known for the animals tested. Information of relatives adds to the accuracy of the **FEC** breeding value estimation. Where link sires are used across years, the use of **EBVs** will enable a year to year variation to be estimated, allowing a comparison of animals from different drops.

Most **EBVs** fall in the range of **-1 to +1** for the worm resistance trait.

To obtain a reliable **EBV** for worm resistance of the sire, testing of 15-20 male progeny is required. If there are insufficient males then ewe lambs can be used, but the ewe lambs of all sires must be tested to prevent biasing the results when comparing sires, as sex may have an effect on the **FEC**.

**EBVs** remove the year to year bias. It must be remembered that **FEC** is a relative trait. An individual count of 500 means nothing in itself. An individual with this count could be resistant if the average for the group is 1500 but very susceptible if the average for the group is 200. The relative performance of sheep within the group is very important with worm

resistance because of the great variation in egg counts between properties and years. This variation is much greater than the variation in fleece weight or fibre diameter. That is why the worm resistance measurement is best expressed in standardised units rather than raw egg counts.

#### **Which Animals To Measure? Rams or Ewes or Both?**

Most ram breeders obtain **FEC** values for young rams to assist in the selection of replacement sires and provide information to their ram buying clients.

Nemesis states that selecting ewes is of marginal value and resources should be directed towards improving the accuracy of the breeding value for sires. However, if the cost of selecting replacement ewes is ignored then putting a selection pressure on the ewes will be valuable. Particularly if the pressure for selection for worm resistance is low at 10% or 25%. *Sire line information is critical for all traits. A ram producing a 14 $\mu$  fleece will not necessarily pass this onto its offspring unless the sire line has a negative **EBV** for this trait which holds true for **FEC EBVs**.*

#### **Selection Objectives**

*There is no marked relationship between **FEC** and production traits. Therefore it is possible to find highly desirable rams which are also genetically more resistant*

- Choose rams normally and then use the **FEC EBVs** to independently cull the susceptible animals—that is those with a + **EBV**.  
*A word of warning to studs! It is a waste of time, money and effort to use **FEC EBVs** to help make the final selection between 2 or 3 rams. Studs should still attempt to exclude positive **FEC EBVs***
- Combine the **FEC EBV** into a selection index [personal or commercial] with other valuable traits such as fibre diameter and fleece weight. The amount of selection pressure to be placed on worm resistance in the selection index will need to be decided by the individual breeder. Applying some pressure even 10% is a start if studs are not confident to go higher at the start.

**Time of Measuring Faecal Egg Counts**

The immune system of sheep needs to be stimulated by worm challenge before genetic differences can be expressed. The optimal time for faecal sampling is determined by the seasonal rainfall pattern.

- In the summer rainfall areas it is preferable to measure young animals at least 6 weeks after weaning so that maternal effects have had time to dissipate and worm challenge been experienced. The best time is when sheep are 6-14 months of age.
- In the winter rainfall areas with dry summers it is best to test young sheep after the autumn break to allow for sufficient worm challenge.

The main determinant will be that sufficient worm eggs are present. For properties with mainly black scour worms egg counts will need to be in the range 200-500 whilst for barber's pole 500-1000 is required. There should be less than 10% of sheep with zero counts.

**WHAT TO LOOK FOR IN A RAM CATALOGUE**  
 A sire with an average resistance has an egg count EBV of 0. Use of this sire in a stud should result in little or no change in worm resistance. A very resistant ram will have an EBV of -1 and the use of this ram should decrease egg counts in the next generation.  
 A susceptible ram will have a positive egg count EBV and should increase egg counts in the next generation. In the future it will be useful to have the value of this trait translated into a predicted egg count of the offspring as in the table below.

**Predicted Faecal Egg Counts for Progeny of Rams With Varying FEC EBVs**

FEC EBV	#FEC Estimated Progeny Value	Predicted FEC of Progeny When Mean Egg Count of the Group is =500
-1	-0.5	260
-0.8	-0.4	300
-0.6	-0.3	340
-0.4	-0.2	390
-0.2	-0.1	440
0	0	500
0.2	0.1	560
0.4	0.2	630
0.6	0.3	700
0.8	0.4	780
1	0.5	860

Ram buyers can see the variation between sires with different **FEC EBVs** and use this information to select rams that are going to produce offspring with a lower faecal egg count. For example if a decision to drench is based on an average egg count of 500 for barber's pole then progeny from sires with a negative EBV will not need drenching!

Calculation of **FEC EBVs** can be obtained from by breeding services in most states and a list is available. Please contact myself or Nemesis for this

**Breeding values for worm control should be looked for at the point of sale and breeders encouraged to provide this information. How much pressure is being applied is also critical. The higher the pressure the faster will results be obtained**

The selection lines produced by Nemesis were the result of 100% pressure for worm control using both rams and ewes. It took 10 generations to produce a divergence and a significant difference between the high, low and non-selected lines. Studs cannot be expected to sacrifice all wool traits but they may have to sacrifice some highly productive individuals with positive **EBVs** for ones less productive with negative **EBVs**.

Selecting for resistance is particularly important for producers in the barber's pole endemic areas where closantel and avermectin resistance is common. The loss of sustained activity chemicals such as closantel, Ivomec and BZ capsules leaves the cupboard very bare. As many of my clients have experienced this year short acting chemicals have given only 3 weeks cover and grazing management for this parasite is difficult and takes a long time to put into place. Selection for resistance will take a long time and will be dependent on how much pressure studs place on this trait. It is critical to start now.

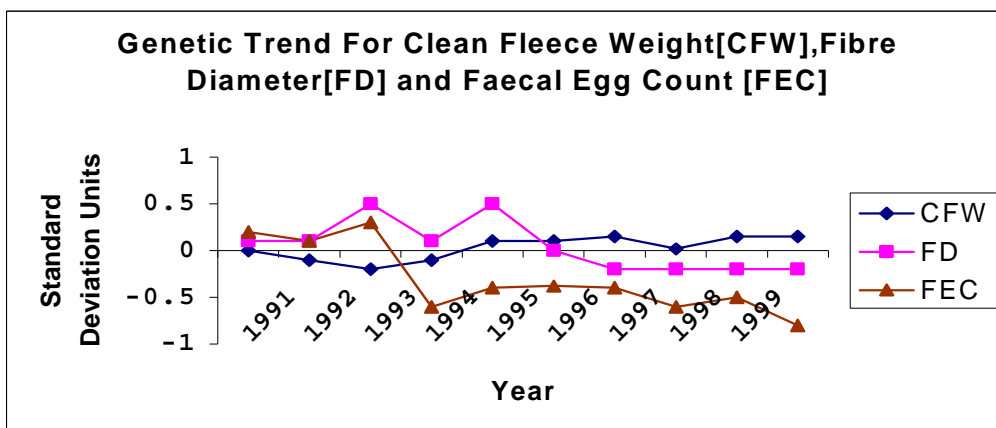
**It is not necessary to purchase from studs selecting for resistance in these barber's pole areas as there is cross resistance to different worm species.**

One New England stud has been selecting for worm resistance for nearly 10 years. This selection was based on measuring **FECs** to rank young rams and incorporating these in a selection index to make 50% of the possible gain in worm resistance whilst optimising gain in fibre diameter and clean fleece weight at a micron premium of 3%. The index for wool micron premium has recently been changed to 8% with an

added staple strength index but maintaining the same pressure for worm resistance.

The Graph below illustrates the trend over 10 years of selection with an increase in fleece weight, a reduction in micron and in egg counts.

Most of the 1998 drop have negative **FEC EBVs**.



In the last few years it has been observed that the stud sheep in particular have required fewer broadspectrum drench treatments as the level of resistance increases. this sheep producer still employs the use of grazing management with cattle rotations and controlled release capsules in lambing ewes. Selection for resistance is only a very small part of an integrated worm control program but not one which should be ignored. Without direct comparisons between individual properties and this one it is not possible to note if your worm control is better or worse than this new England property nor is it possible to isolate the effects of capsule use and grazing management on drench frequency.

However, the **FEC EBVs** are improving and it is up to the stud and purchasers of its rams to observe any deleterious effects on wool traits.

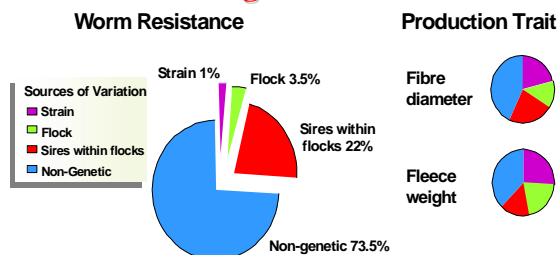
**Resilience versus Resistance**

Resilience reduces the impact of worms. Early research indicated that there is a close relationship between resistance and resilience. Resistance is a trait which can be measured easily, is moderately heritable and so can be improved with selection. Resilience is not measurable and has a low

heritability. Resistant sheep will reduce pasture contamination-resilient sheep do not. Studs should not be sidetracked with individuals which apparently thrive on high burdens-if this cannot be passed onto to their progeny then it is only of value to that individual!

The non-genetic component of the variation in egg count is high and we can only influence the genetic component by selection.

**Resistant sires are present in existing ram sources**



- ♦ Most genetic variation in worm resistance is found between sires within flocks (22%).
- ♦ In Merinos there is little variation between bloodlines (3.5%) and strains (1%), which contrasts to that for fleece weight and fibre diameter.

**ACHIEVING THOSE WEIGHT GAINS IN MERINO WEANERS**

*Betty Hall with reference to data collated by Caroline Gaden executive officer Cicerone*

Cicerone is a producer led project with a motto "compare-measure-learn-adopt". Producers identify specific problems common to the grazing industry in the northern tablelands, initiate any research undertaken.

The Footrot PIRD studies are a fine example of what Cicerone has done for sheep producers in the tablelands which has application throughout the whole of Australia. Research, which would never have been completed had Cicerone not persisted. The power of producers defining a problem and enlisting the help of "experts" to solve or clarify the situation.

The group lease 200 hectares of land from CSIRO, Chiswick near Uralla. They have created 3 farmlets of 50 hectares each on which fine wool ewes and their progeny are run.

**Farmlet A**

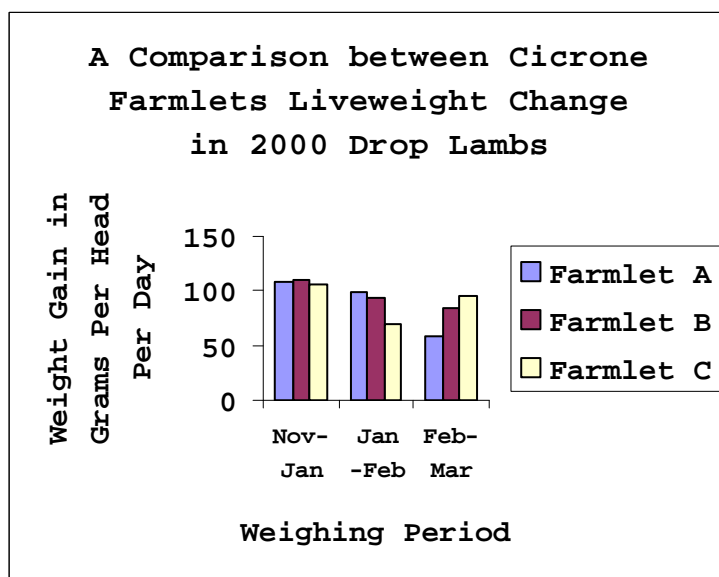
Has 8 paddocks with a target to increase available soil P level to 60ppm[bicarbonate extract]. Super has been applied at 250kg/ha/year.

**Farmlet B**

Has 8 paddocks and will aim for a soil P of 20ppm with an application of 125kg/ha/year over 1/3 of the farmlet. That is a third is supered each year.

**Farmlet C**

Has 16 paddocks to allow for controlled grazing with the flexibility to further subdivide if necessary. The super application is as Farmlet B.



The lambs are weighed monthly. The graph illustrates the weight gain of the 2000 drop weaners since marking and mulesing in November 2000. Farmlet A lambs have consistently shown higher body weights than B and C but a significant reduction in weight gain has occurred since February. The farm manager is concerned about the level of scouring-10%-in Farmlet A lambs. On the 20<sup>th</sup> of March he tested scoured and non-scoured lambs with the same result-zero egg counts. Between the 20<sup>th</sup> of March and the 5<sup>th</sup> of April they developed relatively high black scour burdens after grazing a

contaminated paddock for 15 days and they were drenched. To that date they had the best worm control of all 3 Farmlets the April drench being their first since weaning. These burdens could have caused the scouring which may be persisting because of bowel damage. None of the weaners have been given selenium since their marking vaccination and a mineral drench at weaning. Historical evidence for Chiswick indicates that responses to selenium do not occur. However, the high fertiliser inputs on Farmlet A may have interfered with the uptake of selenium into the plants. We may be

seeing productivity loss and scouring due to selenium deficiency. We will be conducting a selenium supplement response trial on all the Farmllets with weighings at 2 weekly intervals. Half of the weaners on each Farmllet will be given a selenium drench and half no selenium. Results will be published in the next Newsletter.

#### Compare-Measure-Learn-Adopt

Weaners on Farmllet C experienced a major reduction in weight gain between January and February but recovered by the March weighing. These lambs are being rotationally grazed with moves at roughly 7 day intervals. They may have grazed poorer pastures in that period but they also had high burdens in late March when the other Farmllet lambs had extremely low counts. Whilst the majority of worms were barber's pole a significant burden of black scour worms were present which would have reduced feed intake and so growth rates.

#### Compare-Measure-Learn-Adopt

#### Comparison between Farmllets Egg Count Data

Test Date	Average Egg Count		
	Farmlet A	Farmlet B	Farmlet C
21.2.01	0	80	28
20.3.00	0	80	832 drenched
5.4.00	500 drenched	96	-
17.4.00	-	-	0

Why did our Farmllet C lambs develop higher burdens than the traditionally "set-stocked" lambs?

All Farmllets had paddocks which had not been grazed by sheep for 7 to 8 months. Farmllet A and B lambs felt the full benefit of these prepared paddocks for nearly over 2 months. Whereas Farmllet C lambs had a very brief affair with these lower worm areas before being moved onto the original ewe-lamb paddocks. The **learning** experience from this is to subdivide any clean areas so that the rotation includes grazing these areas for a longer period.

Farmllet B continues to be the cleanest so far but we have brought all the

lambs into line with a Rametin+BZ drench.

#### Future Research on the Cicerone Farms

- ❖ Evaluation of mulesing at marking compared to mulesing in the autumn. Half of the ewe and wether lambs on each farmllet will be mulesed at marking in 2001 and half in the autumn of 2002. We will be able to study weight gain differences and tensile strength.
- ❖ Evaluation of sheep coats after shearing. Half the ewes on each farmllet will be coated after shearing. The coats will be removed before lambing. Condition score of ewes at lambing, birth weights of lambs and growth rates will be recorded.
- ❖ Ongoing pasture and animal performance will continue to be recorded.

**CICERONE NEEDS YOUR CONTINUING SUPPORT**  
It cannot be producer driven and responsive to your needs without members.  
It costs only \$80 a year plus GST.  
Come to the field days-the next on the 31<sup>st</sup> of July.  
We need producer assistance on the Board and as part of the farmllet management team.

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#### THE GRAZIERS WAY

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