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## Selecting highly productive sheep that require less anthelmintic treatment

- What's the effect on production if I select for sheep resistant to parasites?

### Aim to look closely at host resistance

This Meat New Zealand and AgResearch-funded project (1994-1998) aimed to measure the **production** and **economic** effects of selecting sheep with genetic resistance to internal parasites. A sheep with 'host-resistance' is able to successfully resist roundworm establishment and infection. Resistance is estimated by measuring faecal egg counts (FEC) or antibody levels. The trait is moderately heritable, allowing for genetic selection for the trait.

Breeding sheep to require minimal drenching to control parasites has the potential to –

- delay the onset of drench resistance in some circumstances
- reduce parasite egg numbers on pasture
- reduce the potential problem of consumer concerns about drug residues in food
- improve growth rates

#### Key findings

This project found that although fleece weight can decrease if you select solely for resistance, it is possible to find sheep favourable in both production and resistance traits. Farmers should keep a balance between resistance (FEC) and productivity in their breeding programme. The project also found that –

- susceptible lamb flocks had 3 times greater pasture contamination than resistant flocks
- benefits from running a low-FEC/high production flock translate into an extra 3 kg of hogget liveweight at 12 months

This project followed on from work covered in R&D Brief 33. The project involved three key parts.

### Part 1 – production differences between low and high FEC mobs

Two lines of Perendale sheep differing in their genetic resistance to internal parasites were grazed separately.

The more resistant sheep had 4.5 times (22%) lower FEC than the susceptible sheep. All lambs were drenched 3-5 times in the first year of life.

Compared to the more resistant flock, the susceptible flock had –

- three times more larvae on the pasture
- 13 times higher lamb faecal egg counts (FEC) (463 versus 34 eggs per gram)
- higher worm egg viability levels
- similar amounts of dagginess

The production differences between the susceptible and resistant flocks were significant. The **benefits** of reduced pasture contamination (through running this low-FEC flock **separately**) are estimated as –

- 1.7 kg of extra lamb liveweight by autumn
- a 5% and 8% increase in hogget and ewe fleece weights respectively



When lines of lambs differing in their genetic resistance to internal parasites or liveweight gain under parasite challenge were **run together**, production levels were slightly lower for the resistant types compared to the susceptible types. This was the case whether the lambs were minimally drenched (1500 eggs per gram trigger level), drenched weekly or treated constantly via capsules. A reason for this could be because the resistant

lambs immune response to worm parasites causes a temporary inflammation of the gut.

To really get the benefit of resistant sheep it is best that they are not grazed with susceptible sheep (that shed high numbers of eggs) and that levels of larvae on pasture are kept low through good grazing management.

## Part 2- what's the financial impact of selecting resistant rams?

The second part of the project tested the economic benefits of breeding for host resistance to internal parasites. This was done using a computer model and farmlet data.

The results suggest that when host resistance is included along with production traits in a **dual-purpose selection index** for sheep, the economic value of the genetic gain increases by more than 20%. In other words, ram breeders should expect a 20% improvement in the economic value of their current selection index by selecting rams for both resistance to internal parasites and for high production traits, under a minimal drenching regime.

For a hogget at 12 months of age, this 20% translates into a -

- 3 kg liveweight advantage
- 0.31 kg advantage in fleece weight



By knowing the financial benefits, correct emphasis can be placed on worm egg count measurements in breeding programmes. The benefits are primarily from less contamination of pastures by parasites.

## Part 3 - passing the information on to sheep breeders

This and an earlier Meat New Zealand project provided information to the WormFEC™ breeding service. Launched in 1994, WormFEC™ provides (1) advice to ram breeders on how to measure host resistance and (2) an overall index of resistance. In 1998 WormFEC™ provided estimates of breeding values for about 10% of performance recorded dual-purpose rams used by the NZ industry.

The economic value of selecting for 'resistance to parasites' has been incorporated into WormFEC™. WormFEC™ has been included in the Sheep Improvement Limited (SIL) performance recording system.

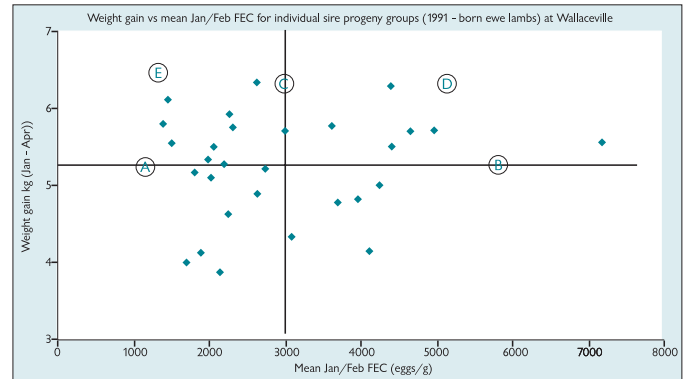
## Implications for farmers

Breeders will make the most profitable gains by using a selection index that incorporates both production and FEC traits. Eggs shed on to pasture will decrease by 4% a year under a selection programme for both high production and parasite resistance. Good pasture and stock management to reduce pasture larvae contamination will also boost production.

As part of the project, three across-flock and year

evaluations were done on 30 flocks (25,000 progeny born annually). Results suggest that environmental differences within NZ do not greatly affect the ability of some sheep to show natural resistance to internal parasites. Farmers can be confident that rams bought for host resistance will have progeny that perform in a similar way.

## Graph A: Difference between resistant, resilient, tolerant and susceptible lambs (AgResearch)



- A = Resistant** are to the left of the vertical line (i.e. low FEC)
- B = Susceptible** are to the right of the vertical line (i.e. high FEC)
- C = Resilient** are above the horizontal line.
- D = Tolerant** are in the top-right corner (i.e. high FEC but high production)
- E = Desirable** are in the top-left corner (i.e. they perform but have low FEC so they are both resistant and resilient).

## Return on Investment

Information has been passed on to farmers through 25 field days, the WormFEC™ Breeders Manual (300 sent out), newspaper articles and the Parasite Notes Booklet. About 40 stud breeders use a selection index that includes resistance to parasites.

Although the project investment has been considerable, the benefits to producers through improved production without relying on anthelmintics and improved knowledge of genetics is worth the investment. If 10% of rams sold are selected for host resistance, the additional national benefits are likely to average \$5 million over a 10 year period.

## Points to Remember

- This research is funded by Meat NZ, an independent producer-funded body, in partnership with AgResearch.
- The ideal sheep is one that is both resistant and has high production levels.

## Contacts for more information

- For a free copy of the Final Report, Parasite Notes, AgFACTS on internal parasites or R&D Brief 33, 34 and 67 on breeding and feeding for improved parasite control, phone Meat New Zealand on 0800 696 328, free-fax 0800 187 781, visit [www.meatnz.co.nz](http://www.meatnz.co.nz) or email [help@meatnz.co.nz](mailto:help@meatnz.co.nz) and quote R&D Brief 77.
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