

HOW DO WE KNOW THIS REFUGIA PRACTICE WILL WORK?

A field trial funded by Beef + Lamb New Zealand showed that leaving 10% or 20% of lambs undrenched resulted in a significantly lower level of drench resistance in the worms on pasture, compared to when all animals were drenched.

“This is the first research in the world to show that using refugia as a management tool can dilute resistant worms on pasture.”

AgResearch scientist, Dr Dave Leathwick, reached this conclusion by comparing the resistance status of worms shed by nine different mobs of Romney lambs. All nine mobs of lambs (20 lambs per mob) were uniformly infected with a mixture of albendazole-resistant and susceptible parasites.

0%, 10% OR 20% LEFT UNDRENCHED

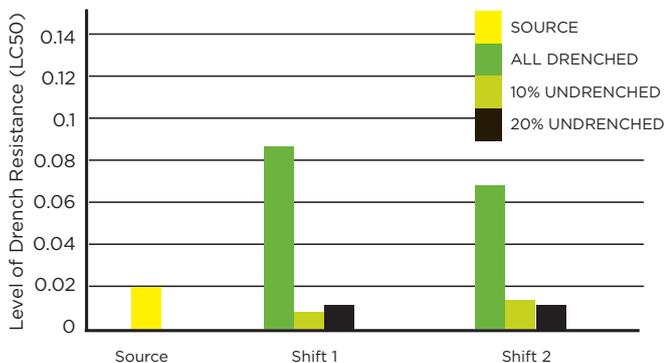
Different proportions of the mob were left undrenched (either 0%, 10% or 20%). After grazing their paddocks for seven weeks the lambs were again drenched and moved to a second set of ‘clean’ paddocks, again for seven weeks.

WORM-FREE ‘TRACER’ LAMBS TO SAMPLE WORMS ON PASTURE

The worm populations created by the different treatments were measured by putting fresh ‘parasite-free’ lambs on the blocks three weeks later to sample the worm populations. Drench resistance was measured using larval development and egg hatch tests.

Results showed that when 20% of lambs were left undrenched, resistant worms on pasture were diluted 10 times compared to when all lambs in the mob were drenched.

Figure B: Leaving lambs undrenched really helped slow resistance.



Note: ‘Source’ is the original level of resistant parasites found in the lambs (i.e. 0.02).

This graph shows that when all lambs were drenched, the proportion of resistant worms in the population was significantly higher than when 10% or 20% of the lamb mob remained undrenched. The LC50 value is the estimated concentration of albendazole needed to kill 50% of worm eggs or larvae in the resistance assays.

DRENCHING ALL LAMBS INCREASED RESISTANCE FOUR-FOLD FROM ORIGINAL LEVEL

When all lambs were drenched and moved to low-contamination pastures the resistance status of the resulting worm population was greatly increased from the original ‘source’ level.

These results highlight the risk of drenching lambs onto low-contamination ‘safe’ pasture.

PASTURE LARVAE LEVELS WENT UP

The biggest negative from leaving some stock undrenched was that the level of larvae on the pasture increased in the trial. But some increase has to happen for refugia to work.

The essence is to allow enough worms through to dilute the resistant ones without significantly compromising productivity.

Figure C: Faecal Egg Counts (eggs per gram) of ‘tracer’ lambs that grazed after the treated lambs.

TREATMENT NO.	% LAMBS UNDRENCHED	FEC OF TRACER	
		20/03/06 FIRST-SHIFT	17/05/06 SECOND-SHIFT
1	0	325	533
2	10	1794	1563
3	20	1186	1855

In the trial, FEC levels of ‘tracer’ lambs (used to sample worms on pasture following original grazing) were highest in tracer lambs on the pasture where mobs of undrenched lambs had grazed. These contaminating lambs had been seven weeks without a drench.

Results of other trials showed that production losses from leaving 10-15% of lambs undrenched were difficult to measure. This indicates that they may be very small.

However, the worms that were from Treatment 1 (lambs all drenched) were more likely to be resistant.

PUTTING REFUGIA INTO PRACTICE

Exact recommendations on how to create refugia will vary between farms. For example, when it is best to leave stock undrenched, what proportion to leave undrenched and what the implications on production might be.

It is suggested that farmers develop a plan with their veterinarian on how refugia could be used based on:

- The drench resistance status of the worms on the farm. It has been calculated that the proportion of animals required to be left undrenched goes up dramatically as drench efficacy goes down. If a drench is 99.9% effective then 1% left untreated is probably enough. If the drench used is only 95% effective then closer to 30% untreated is required to give the same dilution of resistant worms.
- Sheep/cattle ratio, stocking rate, other farm enterprises.
- Key risk periods to stock from parasitism (i.e. when is it best for some stock to go undrenched).
- Current ewe management/drenching policy (i.e. can undrenched ewes shedding susceptible eggs be grazed after newly-drenched lambs).
- Feed quantity and quality.

“While it is early days, the Wormwise Technical Advisory Group (made up of New Zealand experts) believes there are general principles that can be followed when practising refugia in mobs of weaned lambs or hoggets.”



GENERAL PRINCIPLES

- Where possible find a solution that doesn't involve leaving lambs undrenched i.e. focus on ewes, 2ths or hoggets.
- If feed supplies are low/poor quality, there is a greater risk that parasitism in undrenched stock will impact on production. However, if feed quality/quantity is good, lambs are up to target weights and pasture is 'clean' then it would be an ideal time to leave some lambs undrenched.
- The benefit of leaving some lambs undrenched (and a refugia of susceptible worms) is greatest when lambs are going onto 'clean' pasture.
- Start conservatively, i.e. leave no more than 2-5% of lambs undrenched rather than 20%. Leaving too many undrenched may create a problem later in the season with accumulated parasite contamination of pastures.
- Choose the best condition animals to remain undrenched each time. The heaviest animals are doing well so if they take a check from being left undrenched they will slip back into the 'drenched' portion of the mob next time round.
- It does not matter if the same animals are excluded at each drenching, as long as their condition is okay. Both animal welfare and animal production losses must be considered.
- A comprehensive drench test (faecal egg count reduction test and cultures) should be carried out regularly, with frequency depending on drench resistance risk factors on each farm.
- Even if a test shows that worms on your farm are not resistant to any of the three main drench families, it would still be of benefit to practise refugia. This is because resistant genes are likely to be present on every farm and keeping them diluted is the best long-term option to retain the efficacy of your drenches.

CATTLE

It is likely that practising refugia in cattle mobs would also reduce the proportion of resistant worms on the pasture.

FINDING A BALANCE

Leaving a few animals undrenched can add a little to pasture contamination but it is likely that acceptable productivity will continue.

Resistance is a bigger long-term cost than short-term lower production.

The cost of lower production from leaving some young stock undrenched is going to seem more acceptable as resistance to drenches becomes more widespread.

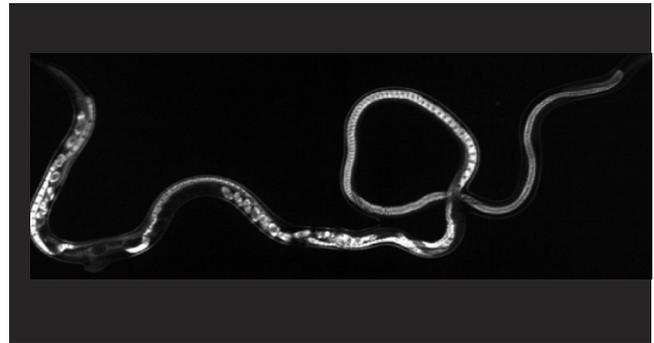
For example, lower production in the short term may be worth it if it delays the onset of a situation where 100% of a hogget mob is 5 kg lighter because of widespread drench resistance on a farm.

OTHER PRACTICES TO REDUCE/DELAY WORM RESISTANCE TO ANTHELMINTICS

The challenge ahead is to find ways to maintain low levels of pasture infestation, yet retain a useful pool of susceptible worms. Ways to do this include:

- Avoid drenching lambs onto 'clean' pasture unless you have a plan to introduce/maintain refugia (e.g. leave a proportion undrenched or follow with undrenched ewes).
- Avoid drenching more frequently than every 28 days unless there is a special need.
- Where possible avoid the use of long-acting drenches and capsules.
- Adopt a quarantine drench protocol for introduced stock.
- Use effective combination drenches, even if resistance has not been identified on your farm.
- Weigh animals so they are not under-dosed.
- Apply the correct dose using the correct technique as per the label instructions.

Figure D: Are they resistant? Adult internal parasite with eggs.



ACKNOWLEDGEMENTS AND MORE INFORMATION

This fact sheet is based on research conducted by a farmer and scientist mentor group who helped guide the project to ensure relevance to farmers.

This fact sheet was reviewed by Dr Dave Leathwick, AgResearch, in March 2017.

For more information contact Beef + Lamb New Zealand on 0800 BEEFLAMB (0800 233 352) or visit www.beeflambnz.com.

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