



Breeding towards a poll flock with the Sheep CRC Poll test

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Key points

- Poll status is completely controlled by genetics; environmental factors have no impact.
- Development of horns in sheep appears to be mostly controlled by a single gene.
- The Poll test identifies carriers of the horn gene and can assist in eradicating horns.
- Producers should consider horned status as only one trait in a breeding program.
- The use of Poll test can reduce the chance of breeding horned Merino rams by 75% in just one year.

The genetics of horns and the development of the Sheep CRC poll gene test

Observations of 2300 Merino progeny in the Sheep CRC Information Nucleus Flock has identified three possible gene combinations that determine whether a sheep is horned (H) or polled (P): HH, PH or PP. Because the horned gene is recessive, horned animals must carry the trait from both parents. By using DNA testing to identify whether an animal is PP, PH or HH, breeders can predict whether the progeny of a ram are more or less likely to have horns when mated to ewes with different genotypes.

The Poll test is predictive of the horn status of tested animals. HH rams are almost always horned, whereas PH rams are rarely horned and PP rams are always polled. The poll test is based on a genetic marker and not on the gene itself. The accuracy of predicting poll status is about 95%.

Prior to development of the Poll test, breeders relied on a visual assessment of the horn site and/or progeny testing, which takes many years to confirm whether a phenotypically polled ram is PP or PH. Overall, the Poll test will allow ram breeders to increase the number of PP rams and potentially capture the rewards given the commercial preference for polled Merinos.

Which breeders can benefit?

This test benefits ram breeders who want to produce more polled and fewer horned rams. Even though you may not see horns very often, the frequency of the horn gene can be quite high. In fact, even if only 1% of males appear with horns, the horn gene is still present in around 10% of the flock. This means that in 10% of matings a sire or dam could pass on a horn gene to its offspring and 18% of polled rams being used will be carriers of the horn gene. The new genomic test for the Poll gene means that, in poll flocks, breeding from rams that are carriers can be avoided.

The terminology of polledness

- Homozygous polled (PP) will only pass polled genes on to their progeny, and will mostly produce polled lambs.
- Heterozygous polled (PH) can pass on either polled or horned genes to their progeny and are capable of producing lambs that are horned, polled or have scurs or half-sized horns (depending on the genetics of the other parent).
- Homozygous horned (HH) will only pass horned genes on to their progeny and are capable of producing horned or polled lambs (depending on the genetics of the other parent).



Figure 1. Variety of horn phenotypes.

How fast can the number of horned rams be reduced?

Producers wanting to transition to a polled flock can achieve the desired outcome in a variety of ways. The pathway chosen will affect the time taken to achieve a polled flock and will also affect the cost. The Sheep CRC has researched the impact of various DNA testing regimes for breeding out the presence of the genes responsible for horns on Merinos based on a model flock to help inform breeders about the options available.

The Sheep CRC has modelled the impact of DNA testing a poll flock with 1000 ewes, using 25 rams each year. Each year 10 of the rams are replaced by young rams and 410 new ewe replacements are needed.

Based on a flock with a horn gene frequency of 10% (1% rams horned) the use of the Poll test only on rams to be used can reduce the chance of breeding horned Merino rams by 75% in just one year, where not selecting for horns or polls would generally result in six or seven horned rams born each year, but less than two annually if rams were tested and only full polls (PP) were used (Figure 2). It would take a little over 20 years to completely remove the horn gene from the flock.

If ewes were tested as well, the response was even greater, with the chance of breeding horned Merino rams reduced by 80% in just one year (Figure 3), and the horn gene completely removed from the flock in just seven years.

In the transition to a poll flock there will also be rams with the PH genotype. These rams will show a variety of phenotypes from small bony knobs at the horn site hidden by the wool, through larger knobs obvious above the wool, to scurs that may curl back toward the skull, and finally to horns that can reach about half the size of the true horned genotype.

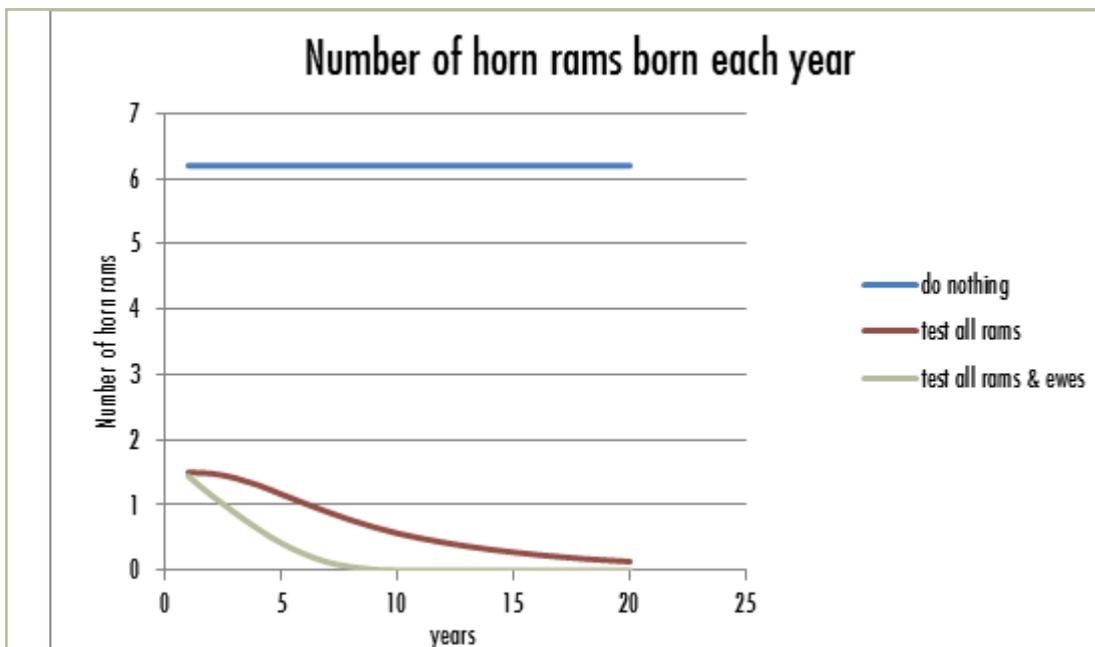


Figure 2. Predicted number of horn rams born each year for three approaches to testing over a 20-year period where initial horn gene frequency was 10%.

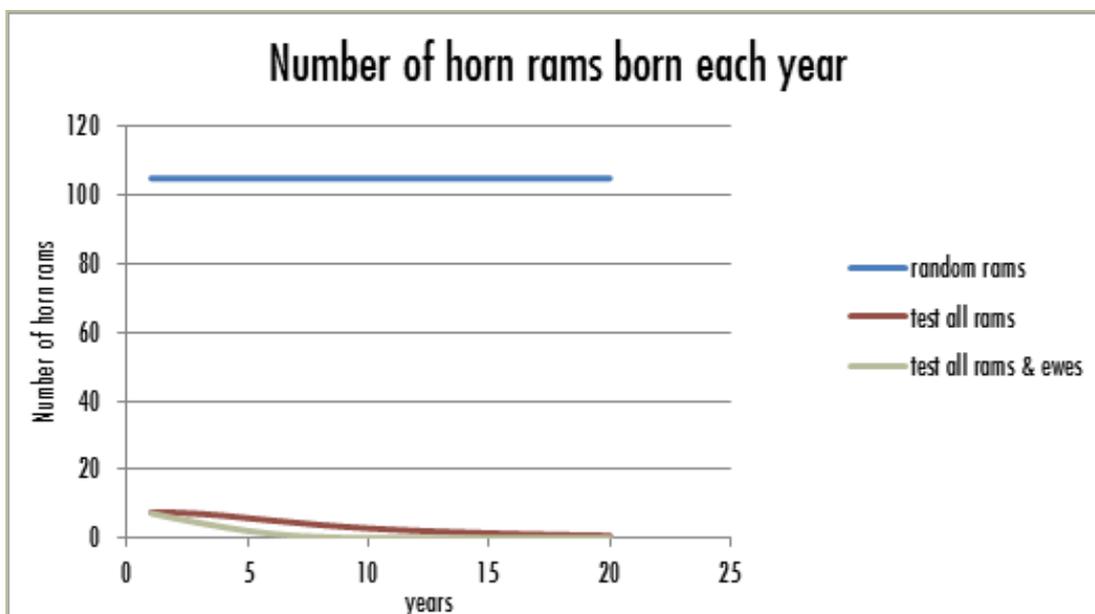


Figure 3. Predicted number of horn rams born each year for three approaches to testing over a 20-year period where initial horn gene frequency was 50%.

While testing rams as well as replacement ewes reduces the frequency of the horn gene more quickly than just testing rams, the cost of testing is much higher and this should be carefully factored into breeding budgets.

There is also potential for ram breeders to transition quickly from flocks where many more animals carry the horn gene. Based on the same model flock as above, but with a horn gene frequency of 50% the number of ram lambs born that will be horned can be reduced by over 90% in just one year by testing all new rams. This equates to a change from over 100 rams with horns born per year to fewer than 10 just by testing and using only homozygous poll (PP) sires. It is predicted that there would be less than three horned rams born per year after 10 years of using PP sires.

Take home messages

- The Poll test allows breeders to accurately identify which animals are PP versus PH.
- Rapid reductions in the number of horned animals can be achieved simply through testing sires and using only PP sires.
- Even greater reduction in horn genes can be achieved by testing ewes as well, but this comes at a substantial cost.

Further information

Sheep CRC website: www.sheepcrc.org.au, then choose Genotyping tests.

Sheep CRC Practical Wisdom notes:

- Genomics and DNA testing: new tools for ram breeders to accelerate genetic gain.
- Sheep CRC genomic test for Merinos—what are the benefits?
- Sheep CRC genomic test for maternal breeds—what are the benefits?
- Sheep CRC genomic test for terminal breeds—what are the benefits?