GETTING GOOD GENETIC OUTCOMES

Mark Young

Veterinarian Trevor Cook's article in the March issue of *Country-Wide* (p 73) identified a key issue about selection – the danger of being fixated on one or just a few traits when others are important in determining the profit or efficiency of a flock or herd.

A simple rule in animal breeding is that "if it is important, include it in your breeding objective".

Trevor cited the example of all-out selection for milk yield leading to issues with fertility in dairy cattle. The UK and New Zealand dairy industries have addressed this by introducing cow reproduction traits to their breeding programmes. Bulls are now rated on the probable success of their daughters in getting pregnant at the time the farmer wants, as well as producing a lot of milk of an ideal composition.

"It is right that the more fixated you are on few traits (focusing on just one is the most extreme), the more likely that something else will change in a way that is limiting. Selecting rams and beef bulls under pastoral feeding conditions inherently puts positive selection pressure on most key traits, but you can't tell how a trait is changing if you don't measure it!"

Some of the examples Trevor used refer to simple scientific experiments focused on a single trait. This is clearly not practical for a commercial ram or bull. There is also a danger in using the results of such studies to extrapolate to the general situation. Some good selection experiments have shown that if you apply the same selection regime on different populations you do not get the same results.

An elegant selection programme with mice run over many generations at Edinburgh University led to most of the selection lines dying out due to inbreeding, which caused failure of some aspect of reproduction or health. But not for all lines. Some survived intense levels of inbreeding.

The genetic explanation is that most lines led, by chance, to deleterious genes having a big and ultimately terminal impact on survival. Those lines surviving avoided this by chance – that is, good genes predominated.

This issue of different outcomes from the same selection regime has two possible explanations. One is what we call "founder effects" and the other is differences in inherent genetic variation.

Founder effects are where a sire that is dominant for a key trait is heavily used, but he also passes on his genetic merit for other traits as well. If he has poor performance for another less important or unmeasured trait, then that is also spread through the population when he is widely used. This is why we advise you to define what the important traits are for you, and look for rams or bulls that are rated for those traits. Then try to select animals that have a good balance of merit across those traits.

In Trevor's article, the fox example illustrates a founder effect. It is likely that at some point a more docile animal carried unusual coat colour genes which led to a big change in coat colour of the lines selected for docility - even though coat colour was not being selected for.

It is dangerous to say that selection for docility will lead to the coat colour changes seen in one study. It might not if we repeated the study.

Similarly "bad genes" can piggyback into a population if a ram or bull with exceptional performance is widely used. Many of the deleterious genes that crop up can be attributed to this reason for their distribution. Progressive breed societies address this by not registering any animals that exhibit the bad trait or carry the gene. If they are lucky, they have a gene test which can be used to check that carrier animals are not bred from.

If you think that bad genes are appearing in your flock or herd, make sure you tell your ram or bull breeder. This is critical information for them. If other buyers give the same feedback they can use that to try to identify the source of the problem.

Genetic variation for different traits differs from flock to flock or herd to herd. Due to past selection decisions, one flock of sheep may have more genetic variation than average for wool but less for number of lambs (NLB). As a consequence, selection responses are likely to be faster for wool but slower for NLB compared with other flocks.

The advent of large-scale across flock or herd evaluations is helping us to paint a picture of the genetic landscape for NZ sheep and beef cattle. As this picture develops further, breeders and buyers will be able to better target the genetics they need for their farming operation.

Our goal should be to benchmark genetic scales of merit against what they deliver on farm. Watch out for developments in this area over the next few years.

Remember, tell your ram or bull breeder which traits you want to improve genetically. They need to know their buyer's needs.

B+LNZ and SIL are interested in your views. Please feel free to tell us your thoughts by sending an email to silhelp@sil.co.nz or leaving a phone message on 0800-silhelp (0800-745-435).

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