

Sheep genes go full circle

A genetic 'find' could lift the reproductive rates of India's Decanni sheep.
Whitney Macdonald reports

Understanding why some species of sheep are more likely to produce multiple offspring than others can be found in the genes. World-famous Merino sheep, like their distant relatives the Garole sheep of West Bengal, India, share a genetic trait.

This gene has caught the attention of scientists and shepherds in Australia and India as both groups seek to increase the numbers of multiple births. Manipulation of the Boorola fecund gene, now known as the FecB gene, is offering agricultural advantages to Indian shepherds, often struggling for meat output from Decanni sheep.

The FecB gene was originally named after the south-east Australian farm where it was identified. As evident from the large litter size (often three to four lambs) of Australian merino sheep, those that carry the FecB gene are more prolific than sheep that lack it.

Scientists at the University of New England in Armidale, New South Wales, are working in collaboration with the Nimbkar Agricultural Research Institute in India on an ACIAR-funded project to increase the reproductive rate of Decanni sheep, which lack the FecB gene.

The three-year project, which also incorporates research from the University of Melbourne, is taking place at the Nimbkar Agricultural Research Institute in Maharashtra state in India.

The project, headed by Dr Steven Walkden-Brown, aims to improve the productivity of sheep by introducing beneficial traits from Garole sheep into Decanni sheep.

"In the meat industry, the reproduction rate drives efficiency," says Dr Walkden-Brown.

Decanni sheep that are raised for meat in India typically give birth to only one lamb, while Garole sheep generally have twins.

Shepherds prefer twins because they put less demand on the adult animal feed supplies, while producing twice the meat output when sold at a young age.

"If shepherds were able to rely on the adult sheep producing twins, they could reduce the number of adult sheep kept for breeding, and thus reduce the cost of adult feed," Dr Walkden-Brown says.

Twins are the ideal number of offspring for a sheep.

"There is a critical three-to-four hour window following birth in which the mother needs to develop a bond with the lamb. If there are more than two lambs, the mother will have a much more

difficult time establishing that bond in the short period of time after the birth, and the lambs will fail to thrive."

In addition to having the ideal reproductive rate, Garole sheep are able to live in wet conditions that typically lead to foot rot in other breeds, suggesting a genetic resistance to some parasitic infections.

As part of the ACIAR-supported project, researchers are developing ways to exploit the resistance traits of Garole sheep to benefit other breeds that are more susceptible to infection.

While Garole sheep have many of the optimal genetic traits sought by Indian shepherds, they lack other traits that are important for survival in India.

Garole sheep are very small, with short legs, and weigh as little as 15 kilograms. Decanni sheep are almost double the size.

The physique of the Garole sheep makes it difficult for them to sustain the physical requirements of the migratory lifestyle of an Indian shepherd, necessitated by land and food limitations.

In 2001, work conducted by researchers in New Zealand identified the presence of the FecB gene in Garole sheep as the reason for their increased fecundity.

Following the New Zealand group's discovery, the ACIAR-supported researchers were able to

develop a DNA test for rapid detection of the FecB gene.

"With the aid of this genetic tool, we are able to screen large numbers of sheep for the FecB gene following extensive cross-breeding between Garole and Decanni sheep," adds Dr Walkden-Brown.

Through multiple rounds of cross-breeding and genetic testing, the project has already had some very successful outcomes.

"In the first year of the project, Decanni sheep bred with the FecB gene did not show a significant improvement in reproductive rate, due to inadequate adjustments to the research environment," explains Dr Walkden-Brown. "However, by the second year, once the sheep had adjusted to their surroundings, there was a statistically significant increase in the number of twin offspring."

Scientists are optimistic about the outcomes of this project.

"ACIAR has provided this project with enough support that we have been able to test a basic hypothesis, and are now able to take it to the natural farm setting, to test the success in a larger population," Dr Walkden-Brown says.

"Our future work will examine the scope for such reproductive technology in the Australian sheep industry." ◀



Shepherds in Maharashtra are beginning to benefit from more prolific sheep.