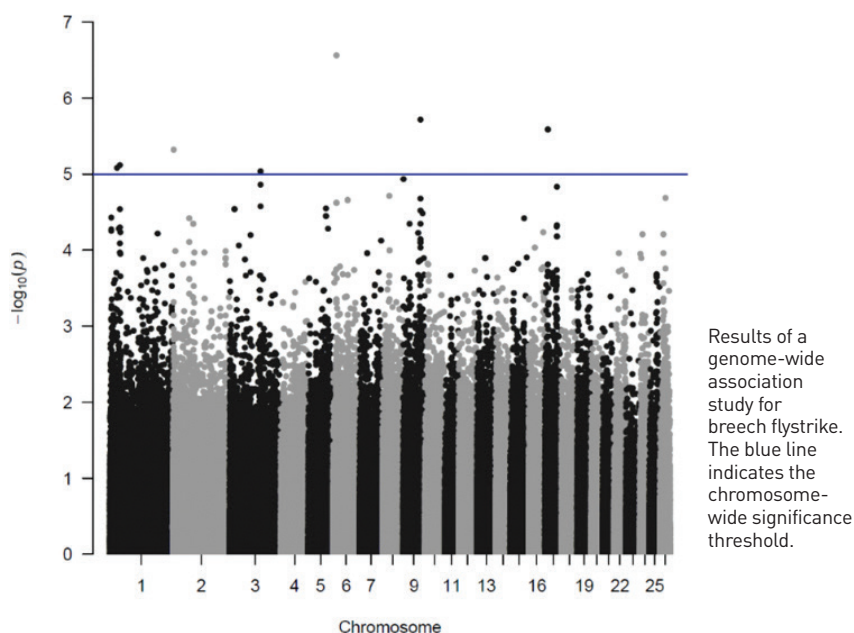


CAN GENOMICS ASSIST WITH REDUCING THE RISK OF BREECH FLYSTRIKE?

KEY FACTS

- In a recent AWI-funded study undertaken by CSIRO, the use of the genomic information for breech flystrike resistance was explored, based on 1,500 sheep from the Breech Strike Resource flocks in NSW and WA.
- The research indicates that unfortunately there are no 'major' genes associated with breech flystrike, breech wrinkle, breech cover and dag; instead these traits are influenced by many genes, each with small effects. Therefore, a genetic marker-assisted selection approach will be largely ineffective in breeding for breech strike resistance.
- However, a genomic breeding value (GEBV), which looks like an ASBV and is used in exactly the same way, will be a more effective tool to add information about the associated traits of wrinkle, cover and dag but, it requires an expensive reference flock where sheep are monitored for the appearance of breech strike. Ways to create a cost effective 'reference flock for breech flystrike' will be explored.

Breech flystrike resistance is a difficult and expensive trait to measure and new research indicates that a genetic marker-assisted selection approach to breeding for breech flystrike resistance will be largely ineffective. However, genomic breeding values, well suited to hard to measure traits, may have a role to play because they harness all the sheep's genomic information.



BACKGROUND

Genetic improvement is a safe and permanent method to improve breech flystrike resistance in Merino sheep.

SheepGenetics currently provides Australian Sheep Breeding Values (ASBVs) for the breech flystrike resistance indicator traits of breech wrinkle, breech cover and dag. These are useful and drive genetic improvement, however, the most effective genetic response can be achieved by selecting for breech flystrike resistance itself, but it is very difficult to do commercially.

Routine data recording for genetic improvement of breech flystrike in untreated sheep is labour intensive and expensive on commercial sheep properties and falls into the basket of a very "hard to measure trait".

With the rise of genomic selection tools, often well suited to hard to measure traits, the questions was asked: "Can genomics assist with breeding for reduce risk of breech flystrike?"

WHAT IS GENOMICS AND HOW DOES IT WORK?

Technologies for genomic and marker assisted selection have improved dramatically in recent years. Genomics can provide selection tools for difficult or expensive to measure traits, offering opportunities to increase the accuracy of identifying genetically superior animals for important traits.

What is 'genomics'? In a practical sense, it means that the DNA or genome of an animal is analysed for thousands of genetic markers, which are landmarks that describe the DNA profile.

When a producer undertakes a genomic test, a tissue sample often from the ear or a drop of blood is collected on a card and submitted to a service provider who then establishes the information at all the genetic marker sites chosen in the test (tests vary in size from 800 to 15,000 to 600,000 SNPs or sites).

There are two potential avenues for how genomic information can be used in breeding for breech flystrike resistance, as a:

1. **genomic breeding value (GEBV)**, which looks like an ASBV and is used in exactly the same way and does not require an animal to have breech flystrike phenotypes
2. **genomic test**, which is possible if a few genetic markers have a large effect on breech flystrike resistance and the test predicts the level of breech flystrike resistance.

One requirement for a GEBV, is a reference population, which consists of several thousand animals that have been genomically tested and have been recorded for breech flystrike, such as the Breech Flystrike Resource flocks. With both approaches, breeders only require a genomic test, no phenotype, on their rams to obtain a genomic breeding value or a prediction of breech flystrike resistance.

EXPLORING GENOMIC TOOLS FOR BREECH FLYSTRIKE RESISTANCE

In 2005, AWI initiated the Breech Flystrike Resource flocks in NSW and WA. The Breech Flystrike Resource flocks now represent more than nine years of selection in divergent lines for breech flystrike resistance and its indicator traits, and can be used as a reference population. The flocks form a unique resource to explore the genomic differences for breech flystrike resistance and they provide the opportunity to develop genomic selection tools.

Consequently, AWI has invested in obtaining genomic information in the form of high density DNA profiles on more than 1,500 sheep from the two flocks.

"This is an incredible resource to explore genomic approaches for breech flystrike resistance," said lead researcher Dr Sonja Dominik from CSIRO Agriculture and Food. "Genomic information can potentially fast-track permanent and accumulative improvements not just for breech flystrike itself, but also for the indicator traits of breech wrinkle, breech cover and dag."

In a recent study, the use of the genomic information for both the estimation of

GEBVs or as a genomic test as a tool for direct selection on breech flystrike was explored based on the 1,500 sheep from the flocks.

THE RESEARCH RESULTS

The genome-wide association study for breech flystrike, breech wrinkle, breech cover and dag demonstrated that there appears to be no major genes associated with these traits. This implies that these traits are instead influenced by many genes, each with small effects, suggesting that a marker assisted selection approach will be largely ineffective in breeding for breech strike resistance.

Instead, the results indicate that GEBVs will be an effective tool to further increase genetic progress in breech flystrike resistance (along with phenotypic selection for low wrinkle, cover and dag) by identifying genetically superior sheep for breeding for breech flystrike resistance.

"We were not surprised that we didn't find genes of major effect that would have enabled the development of a genomic test," said Dr Dominik. "We are dealing with a very complex trait that is genetically influenced by thousands of genes.

"However, genomic breeding values harness all the genomic information and they can be

used just like a traditional breeding value."

The combination of genomics with pedigree information would provide a powerful tool to select animals accurately and directly for breech flystrike resistance in addition to wrinkle, breech cover and dags and provide faster genetic progress.

"Genomics is the ideal tool for breech flystrike resistance because it is such a difficult and expensive to measure trait," said Dr Dominik. "To obtain the relevant information for the estimation of genomic breeding values breeders only have to collect a drop of blood on a card."

Genomic profiles from more animals would be needed to increase the accuracy of any breech flystrike resistant GEBVs. However, breech flystrike resistance in Merino sheep is a great example of how a comprehensive toolbox can be built with the addition of new research and technology developments to address an industry problem. AWI continues to investigate options of how a genomic resource flock for flystrike could be generated and maintained. **E**

MORE INFORMATION

View the project report *Genotyping of breech flystrike resource* at www.wool.com.

FLIES AND MAGGOTS - SEND US YOUR BEST



This is your chance to get involved in Australian sheep blowfly research targeting insecticide resistance by submitting samples of maggots and/or flies during the upcoming flystrike season to two AWI funded collaborative projects.

CALLING ALL MAGGOTS!

FREE INSECTICIDE RESISTANCE TESTING available now!

Determine the most cost-effective blowfly treatment for your property.

This project aims to determine the insecticide resistance profiles of blowflies across all wool producing states.

By participating in this research and providing live maggot samples, you will receive test results for your property **which show the chemical groups that are most effective for your flock.**

Contact Narelle Sales at DPI NSW to request a postage paid maggot collection kit or for more information on how to get involved:

narelle.sales@dpi.nsw.gov.au OR (02) 4640 6446



Department of
Primary Industries

WE WANT YOUR FLIES!

WHY?

To contribute to a blowfly genetics project providing critical information for the future implementation of effective blowfly management control strategies, including containment of blowfly resistance outbreaks and development of a flystrike vaccine.

All you will need to do is collect the trapped blowflies at three different times, then simply send to University of Melbourne. **A fly trap, collection tubes and reply-paid post bags for the samples will be provided.**

Contact the University of Melbourne for more information on how to get involved:

blowfly-collection@unimelb.edu.au OR (03) 8344 2362

