



# 2020 FLYSTRIKE PREVENTION RD&E PROGRAM PROJECT SUMMARY REPORT

## AWI FLYSTRIKE PREVENTION RDE PROGRAM OVERVIEW

### AUTHOR

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### OVERVIEW

At the previous Flystrike RD&E Technical Update, held in July 2018, Dr Peter James presented on a collaborative AWI project that had recently commenced to review the risk factors for breech flystrike. This review (ON-00510) has since been completed and outcomes from the work are included in the project summary reports. In preparation for this review a one-day workshop, run by Ausvet Pty Ltd with parasitologists, entomologists, animal production experts, geneticists and research program leaders, was held to develop a causal web for breech flystrike.

The breech flystrike causal web has since been reviewed and enhanced and is now available electronically at [www.wool.com/flystrikecausalweb](http://www.wool.com/flystrikecausalweb). It highlights the complexities of the task Australian woolgrowers face with respect to managing this significant disease and the challenges involved in identifying solutions that meet the diverse range of sheep type, environment and farm business priorities under which they operate.

AWI has recently endorsed an updated *Flystrike Research, Development, Education, Extension and Communication Strategy 2019/20 to 2024/25*, to guide investment in evidence-based RD&E to ensure the lifetime welfare and productivity of sheep and reduce reliance on mulesing (see Appendix 1). This strategy update is largely a continuation of AWI's previous flystrike strategy, with industry continuing to support a balance between long- and short-term investment in flystrike prevention RD&E.

A key event on the AWI calendar, held since 2008, is a biennial one-day flystrike prevention RD&E technical forum for producer representatives, animal welfare representatives and researchers to receive updates and provide feedback on the program. Unfortunately, due to COVID-19 public health guidelines, the 2020 forum had to be cancelled. However, in the past two years, since the previous forum in 2018, the Flystrike Prevention RD&E Program has made significant progress. Some of the RD&E highlights since the last forum follow, and updates on these projects and others are presented in a collection of summary reports of current and recently completed AWI projects, provided by the researchers. These projects represent AWI's diversified investment in the principles of integrated pest management in the search for practical solutions for woolgrowers to prevent flystrike, ensuring the lifetime welfare of individual sheep, whilst reducing reliance on mulesing.

### NON-INVASIVE MANAGEMENT PRACTICES

Non-invasive management tools are pivotal in reducing the risk of flystrike. These include the strategic timing of crutching and shearing, controlling dags and the judicious use of chemical treatments. Parasiticides for the prevention and treatment of all forms of flystrike and worms are important tools in managing flystrike risk and when used strategically and in conjunction with other management tools, further reduce the risk of flystrike in sheep. Better management of current chemicals, the improved delivery of these chemicals and the development of new chemicals will minimise the risk of worms and blowflies and their larvae developing chemical resistance,

ensuring that growers retain access to effective chemical treatments into the future to improve the lifetime welfare of all sheep. The development of vaccines against the first stage larvae of the Australian sheep blowfly (*Lucilia cuprina*) to decrease the susceptibility of sheep and potentially the future development of soil biocides to reduce the adult fly population will add to the management options and reduce the reliance on chemical use and breech modification.

An update to the blowfly genome, completed in 2019, identified 572 genes that are unique to the blowfly and which could be targeted by new chemical treatments or vaccines. Outcomes from this project are already being used to identify potential flystrike vaccine candidate genes that might impact larval growth and development, in a collaboration between the University of Melbourne and CSIRO to develop a flystrike vaccine.

[A review of sheep blowfly pathogen control \(ON-00620\)](#), undertaken by AgResearch, identified a potential novel biocontrol agent *Tolypocladium cylindrosporium* (*T. cylindrosporium*), as capable of killing *L. cuprina*. Whilst there is no record of *T. cylindrosporium* being present in Australia, an initial review of sequencing from Australian soil samples by the researchers suggested that there is a possibility. A project, currently underway (ON-00721 Identifying the presence of *Tolypocladium cylindrosporium* in Australian sheep growing areas), is genetically screening samples of fresh soil, obtained as part of a current University of Melbourne project into *L. cuprina* populations (ON-00624) from several sheep properties in Victoria and Tasmania, using DNA isolation and sequencing to confirm if *T. cylindrosporium* is present.

A project, led by CSIRO (ON-00723 Fleece rot control by vaccination: feasibility review and options), is nearing completion. It will deliver a comprehensive literature review and report on the challenges and feasibility of developing a viable vaccine(s) for sheep targeting the known pathogenic bacterial species (*Pseudomonas spp.* (fleece rot), *Dermatophilus congolensis* (lumpy wool) and other bacterial species) that contribute to the incidence of flystrike.

An investigation into the levels of blowfly resistance to the available chemical treatments (ON-00491) will inform further RD&E supporting growers on the judicious use of parasiticides through an integrated pest management approach to maximise flystrike control and maintain the efficacy of available insecticides. The Sheep Blowfly Resistance Management Strategy Working Group have developed information for woolgrowers on the appropriate use of chemicals to prevent or reduce resistance on their properties. Its members are Brian Horton (University of Tasmania), Peter James (University of Queensland), Deborah Maxwell (ParaBoss), Nick Rolls (Elanco), Jane Morrison (Coopers Animal Health) and Narelle Sales (NSW Department of Primary Industries).

## **BREEDING AND SELECTION**

Breeding sheep naturally resistant to all forms of flystrike is a long-term solution to managing the risk of flystrike. However, there is no one-size-fits-all sheep breeding program and breeding strategies need to be customised to the individual farm, guided by key principles identified from AWI's investment to date in breeding for breech flystrike resistance. Breeding strategies must also integrate objectives for other health and welfare traits such as conformation and reproductive performance. AWI invests strongly in identifying and promoting optimal breeding tools for growers to meet their breeding objective. Examples include Wether Trials, Ewe Trials, Australian Merino Sire Evaluation and MERINOSELECT.

Australian Sheep Breeding Values (ASBVs) for the flystrike indicator traits, breech wrinkle, breech cover and dag score, implemented since 2009, are now available for use by ram breeders and wool producers on 20-30% of recorded animals in MERINOSELECT. A 2019 modelling project to investigate the rate of genetic gain when breeding for flystrike resistance (ON-00524) found that genetic gains can be made in reducing susceptibility to flystrike whilst simultaneously making gains in the major production traits, including fleece weight and fibre diameter. Some ram breeders are utilising these findings and are increasingly breeding lower worm egg count, lower breech wrinkle animals with higher fleece weight, as illustrated in the MERINOSELECT genetic trends. Although modest, genetic trends for lower breech wrinkle are occurring, particularly in medium and fine/medium

wool Merino types. There are individual breeders specifically breeding Merinos for the package of low wrinkle, low dag and high productivity and these breeders are making considerable gains. The gains are easiest in medium wool Merinos in low dag country but quite difficult in Fine and Super Fine Merinos in high dag country. Further information is provided in the project summary report, Breeding and Selection – Industry trends.

Whilst investigations to identify the DNA differences or genomic associations between highly resistant and susceptible sheep for breech flystrike (ON-00515) did not find any major genes associated with breech flystrike, results indicated that future breech trait ASBVs, enhanced with genomic markers for flystrike susceptibility will be an effective tool to further increase genetic progress in breech flystrike resistance. Ongoing consideration of the value of a more novel and cost-effective Genomic Resource Flock for Flystrike remains important.

The 10-year Merino Lifetime Productivity (MLP) project is capturing information on the lifetime performance of over 130 sires that are high and low for wrinkle, dags, breech cover, fleece weight, reproduction, fat and muscle, providing evidence of the productivity of naturally flystrike resistant Merinos. The project summary report, Breeding and Selection – Industry trends, also provides further information on this world first project.

### **ANALGESIA AND ANAESTHESIA**

The development of practical analgesic and anaesthetic treatments for lambs has been a critical recent advance that alleviates pain associated with procedures such as mulesing and marking. Australian woolgrowers have been leaders in adopting anaesthesia and analgesia for husbandry procedures globally. More than 90% of respondents to a 2019 national online survey, undertaken by the University of New England (ON-00540), of Australian sheep producers to benchmark their 2018 parasite control practices, reported using pain relief (analgesics and/or anaesthetics) when mulesing their wether lambs, while 87% reported using pain relief with their ewe lambs. This is a significant increase from a similar 2014 survey, reporting on 2011 practices, (2014 Benchmarking Australian Sheep Parasite Control) in which 64% of respondents reported using pain relief when mulesing wether lambs and 59% in ewe lambs.

AWI has invested heavily in this area to assist with product development and make sure effective alternative anaesthesia and analgesia options are available for woolgrowers to use, and in education and extension to enhance uptake and use. A study, undertaken by Invetus and with input from RedCap Solutions ([ON-00305 Metabolism study to determine the quantity and identify the nature of parent compounds and metabolites in ovine tissue and fluids following the topical administration of Tri-Solfen](#)), provides supportive data to improve the characterisation of residues in edible tissues and as markers for analytical methods for each of the three active compounds in the anaesthetic Tri-Solfen (lignocaine, bupivacaine and cetrimide). Results from this work have been supplied to pharmaceutical companies and made publicly available for use in any applications to the APVMA using such compounds to reduce the withhold periods for these actives and to widen their use for their topical application in surgical wounds and injuries in sheep.

### **BREECH MODIFICATION PROCEDURES**

Historically, AWI has also invested heavily in R&D into options for breech modification procedures to improve the lifetime resistance of sheep to flystrike. This has included the development of Clips, Skintraction and Liquid Nitrogen Process. Independent to AWI, AgVet Innovations has continued to further invest in the development and assessment of their Sheep Freeze Branding, that uses liquid nitrogen.

Additional activities in this area include research optimising mulesing for minimal welfare impact and information on performing the procedure: it includes the selection of lambs needing mulesing, the size of the procedure and optimal management during and following the procedure. What was the National Mulesing Accreditation Program (NMAP) manual has been updated by AWI with WoolProducers Australia and the Livestock Contractors Association and was recently published as the “Plan, Prepare and Conduct Best Welfare Practice Lamb Marking Procedures – Training Guide”. This training guide is designed to assist woolgrowers and their contractors perform lamb marking and mulesing procedures with the utmost care and attention to ensure the best short- and long-term welfare outcomes for the animal. The NMAP guide was only available to those completing NMAP training,

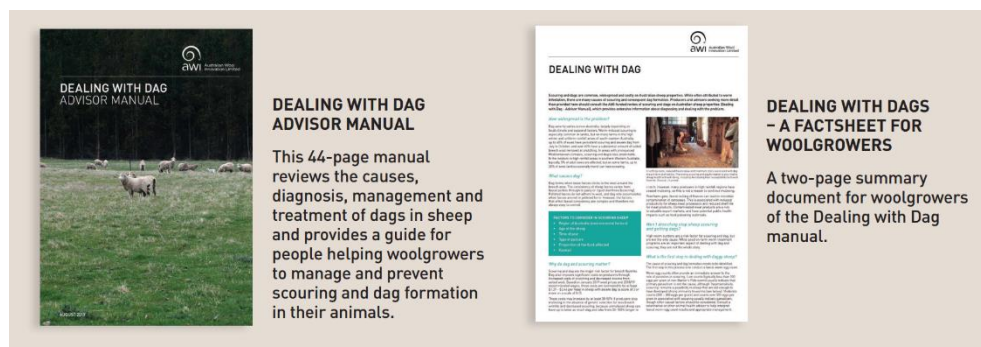
however the new training guide is now freely available to all woolgrowers, as this seen as the best way forward to improve the on-farm husbandry practices for lamb marking and mulesing. This guide is also available to be used by any Registered Training Organisation to provide competency-based training for “Plan, Prepare and Conduct Mulesing Procedures” (AHCLSK334).

## EDUCATION, EXTENSION AND PROMOTION

Communication with woolgrowers to inform them of the outcomes from flystrike R&D investment is a key focus of this pillar, ensuring they have the information they need to improve the lifetime welfare of their animals. Direct communication via the AWI newsletter, Beyond the Bale magazine, AWI website, project newsletters and woolgrower extension networks and workshops remain important, along with working with influencers of woolgrowers, such as their ram breeders, brokers, consultants, animal health companies and veterinarians (public/private sector). Along with the new “Plan, Prepare and Conduct Best Welfare Practice Lamb Marking Procedures – Training Guide” mentioned above, AWI continues to regularly distribute information for woolgrowers and their advisors on best practice flystrike prevention. Available on the AWI website at [www.wool.com/flystrikelatest](http://www.wool.com/flystrikelatest) are recent flystrike prevention publications, including:

- Managing breech flystrike – 44-page manual (February 2019)
- Anaesthetics and analgesics including FAQs (December 2019)
- Tail docking – don’t cut it short (March 2019)
- Premiums and discounts for mulesing status (September 2018).

ParaBoss, funded by AWI and MLA, and delivered by UNE, continues to regularly promote best practice advice on flystrike prevention through both FlyBoss ([www.flyboss.com.au](http://www.flyboss.com.au)) and WormBoss ([www.wormboss.com.au](http://www.wormboss.com.au)). In addition to its website(s), e-newsletter and Facebook page, ParaBoss in 2019 launched a series of podcasts (called Wormcasts) that included episodes relevant to flystrike prevention ([www.paraboss.com.au/multimedia](http://www.paraboss.com.au/multimedia)).



**Figure 1. Information available for woolgrowers and their advisors on Dealing with Dag.**

In 2012, an AWI-funded review on Minimising Dags in Sheep, provided useful information on the costs, reasons for and prevention of dag. Since the 2012 report

was finalised, there has been further research undertaken in this complex area. The aim of a collaborative project (ON-00610), completed in 2019, was to review recent research outcomes on minimising dags in sheep and update the 2012 report, including the development of industry recommendations on the prevention of dags. Extension material produced from this project included a fact sheet ([www.wool.com/dag-factsheet](http://www.wool.com/dag-factsheet)) and advisor manual ([www.wool.com/dag-manual](http://www.wool.com/dag-manual)).

Measuring, monitoring and improving the success of education, training and extension programs in delivering on-farm husbandry practice change for breech flystrike is key to this pillar, enabling industry to better demonstrate its commitment to ensuring lifetime welfare of sheep. A [2017 AWI Merino Husbandry Practices Survey](http://www.wool.com/flystrikelatest) by Kynetec (available on [www.wool.com/flystrikelatest](http://www.wool.com/flystrikelatest)) of Merino producers, to collect comprehensive benchmark data on their current practices, allowed for comparisons in animal husbandry practices between Merino types, states, regions, enterprise size and mulesed and non mulesed Merino enterprises. A 2019 Australian Sheep Parasite Survey (see ON-00540 University of New England), is the third in a series of surveys to measure change in parasite incidence and control practices, with previous similar surveys being undertaken in 2003 and 2011.

The industry is investing strongly in enhanced supply chain transparency and integrity. Communication and engagement with both domestic and international supply chain stakeholders has been steadily increasing each

year. A critical component is the National Wool Declaration (NWD) program, ensuring transparency in the supply chain, by enabling informed wool purchasing decisions between the grower and buyer. The proportion of woolgrowers declaring their wool through the NWD continues to increase. The declaration by woolgrowers of their use of Analgesics and/or Anaesthetics (AA, previously Pain Relief) for mulesing is increasing, as is the proportion of Non Mulesed (NM) declarations (see Table 1).

**Table 1. National Wool Declaration rates by Mulesing Status (Source: AWEX).**

%	2008	2011	2017	2019 YTD* (2019/20)
<b>Non Mulesed</b>	3%	6%	12%	14.1%
<b>Ceased Mulesed</b>	3%	2%	3%	3.5%
<b>Analgesic and/or Anaesthetic</b>	3%	12%	32%	37.9%
<b>Mulesed</b>	29%	24%	20%	17.5%
<b>Not Declared</b>	62%	56%	34%	27.0%
<b>Australian Clip</b>	<b>38%</b>	<b>44%</b>	<b>66%</b>	<b>73.0%</b>

*Figures based on % sum of bales, all breeds and wool types, first-hand offered, P & D Certificates \* YTD = as at 30 April 2020*

### WHAT WE AIM TO ACHIEVE IN THE NEXT TWO YEARS

- Continue to monitor and define blowfly resistance to chemicals and refine blowfly chemical resistance best practice management advice.
- Continue to invest in early trials of new potential actives and control methods for parasite control treatments and vaccines, to the point where Pharmaceutical Companies have sufficient information to reasonably assess product development potential.
- Completion of a three-year long population study of blowflies to identify the extent of genetic differences in the fly across Australia to better manage the risk through effective integrated pest management and resistance management strategies and potential investigations into biological blowfly controls.
- Scope the development of a novel and cost-effective Genomic Resource Flock for Flystrike Resistance.
- Improved phenotyping and accuracy of animal welfare traits (breach, fat, worm resistance, lamb survival etc).
- Communicate the benefits, risks and timelines to breed for lower dags, breach wrinkle, breach cover and higher productivity, and continue to track these longer-term genetic trends.
- Further development, implementation, monitoring and evaluation of education, training and extension programs to ensure lifetime welfare of sheep, including on-going promotion of the use of analgesia and anaesthesia for surgical husbandry procedures.
- Engage woolgrower's advisors to ensure that they are kept abreast of the developments of the RD&E program.
- Further engagement with woolgrower groups, Government and welfare groups to ensure they are aware of the Flystrike Strategy, its outcomes and on farm changes and to provide opportunities for them to provide feedback on the Strategy and its direction.
- On-going independent assessments of the Flystrike Research, Development, Education, Extension and Communication Program.

### FURTHER INFORMATION

Further information on the projects mentioned above, and many others, are addressed in the project summary reports or in project final reports available on the AWI website at [www.wool.com/flystrikelatest](http://www.wool.com/flystrikelatest). If you would like more information on any of the mentioned projects, email: [bridget.peachey@wool.com](mailto:bridget.peachey@wool.com) or call 0429 006 527.

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# FLYSTRIKE RESEARCH, DEVELOPMENT, EDUCATION, EXTENSION AND COMMUNICATION STRATEGY 2019/20 TO 2024/25



## VISION

ENSURE THE LIFETIME WELFARE AND PRODUCTIVITY OF SHEEP AND REDUCE THE RELIANCE ON MULESING.

### BREEDING AND SELECTION

**THE AIM:** Long term solutions to advance lifetime welfare.

- Understand the performance and economic impacts of breeding for reduced flystrike.
- Investigate the, as yet unknown, factors that cause flystrike.
- Improve the accuracy of selection for flystrike resistance traits through phenotyping and genotyping.
- Better understand how to reduce the incidence of dags and urine stain through breeding.
- Track genetic trends for breech wrinkle, breech cover, dags and higher productivity.

### BREECH MODIFICATION PROCEDURES

**THE AIM:** Breech modification procedures to improve lifetime resistance to flystrike.

- Undertake further R&D of the animal welfare impacts of breech modification procedures.
- Undertake further R&D to refine the application protocols for breech modification procedures.
- Support best practice mulesing training.



### NON-INVASIVE MANAGEMENT PRACTICES

**THE AIM:** Improved management practices to reduce the risk of flystrike.

- Monitor and define blowfly resistance to chemicals.
- Refine blowfly chemical resistance best practice management advice.
- Invest in early trials of new potential actives and parasitic control treatments and vaccines.
- Complete a population study of blowflies to identify potential genetic differences to inform blowfly management programs.

### EDUCATION, EXTENSION AND PROMOTION

**THE AIM:** Adoption of best practice strategies to improve the lifetime welfare of sheep, reduce reliance on mulesing and support transparency in the supply chain.

- Develop and implement education, training and extension strategies to improve lifetime welfare of sheep.
- Monitor, evaluate and improve the success of education, training and extension strategies.
- Engage with woolgrower advisors on the RD&E program.
- Ongoing engagement with domestic and international stakeholders to ensure they understand best practice management of flystrike and the welfare implications.

### ANALGESIA AND ANAESTHESIA

**THE AIM:** Improved provision of analgesia and anaesthesia for surgical husbandry practices.

- Investigate longer acting, cost effective anaesthesia and analgesia options.
- Extend advice on analgesia and anaesthesia to woolgrowers.

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Figure 2. AWI Flystrike Research, Development, Education, Extension and Communication Strategy 2019/20 to 2024/25.