

# AWI WOOLGROWER INDUSTRY CONSULTATIVE COMMITTEE

## MEETING PACK

16 FEBRUARY 2018

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# Meeting agenda

## AWI Woolgrower Industry Consultative Committee (ICC)

Friday, 16 February 2018, 8.30am – 3.30pm

AWI's Sydney Office, Level 6, 68 Harrington St, The Rocks

Dinner: 7pm, 15<sup>th</sup> February at Young Alfred Restaurant – Customs House, 31 Alfred St  
(Circular Quay)

The purpose of AWI's ICC is to enable AWI to formally consult with woolgrower representative organisations, allowing them to provide feedback on priorities from their members, and for AWI to report on its performance and plans. These priorities guide AWI's investment and activities.

### SESSION 1: Your members' priorities for AWI

TIME		AGENDA ITEM	DISCUSSION LEAD
8.30 – 8.45	1	<b>Welcome and general business</b> 1.1 Review minutes from previous meeting 1.2 Review actions from last meeting – AWI and ICC members to report back	Wal Merriman
8.45 – 10.25  (10 mins each member and 20 mins each guest participant)	2	<b>ICC members report on their members' R&amp;D and marketing priorities for AWI</b> 2.1 Australian Association of Stud Merino Breeders 2.2 Australian Superfine Woolgrowers Association 2.3 Australian Wool Growers Association 2.4 Broad wool breeds 2.5 Pastoralists and Graziers Association of WA 2.6 WoolProducers Australia 2.7 Birchip Cropping Group – Guest Participant 2.8 Mallee Sustainable Farming Group – Guest Participant	ICC members
10.25 – 10.55	3	<b>ICC member agenda items – request for briefing from AWI on issues</b> 3.1 Broad wool – multiple items raised 3.2 WPA – multiple items raised 3.3 AASMB – AI update 3.4 ASWGA – multiple items raised	ICC members
10.55 – 11.10		<b>Morning tea</b>	
11.10 – 11.40	4	<b>Update from Department of Agriculture, Water and Resources</b> <i>- To include report back on potential for national approach to OJD and Ovine Brucellosis</i>	Joann Wilkie, DAWR

## SESSION 2: AWI report to growers on priorities and performance

11.40 – 12.10	<b>5</b>	<b>AWI report back – annual welfare update and Review of Performance</b> <i>- invite discussion and input</i>	Peta Slack-Smith
12.10 – 12.50	<b>6</b>	<b>AWI report back – on farm R&amp;D</b> <i>- invite discussion and input</i>	Jane Littlejohn
12.50 – 1.10	<b>Lunch</b>		
1.10 – 1.30	<b>7</b>	<b>AWI report back – update on WoolPoll 2018</b> <i>- invite discussion and input</i>	Emma Gittoes
1.30 – 2.00	<b>8</b>	<b>AWI report back - current finances</b> <i>- invite discussion and input</i>	Tracy Marshall
2.00 – 2.20	<b>9</b>	<b>AWI report back – microwave technology demonstration</b> <i>- invite discussion and input</i>	Marcus Majas
2.20 – 3.20	<b>10</b>	<b>AWI report back – marketing activities</b> <i>- invite discussion and input</i>	Laura Armstrong
3.20 – 3.30	<b>11</b>	<b>Summary and close</b>	Wal Merriman

## ATTENDEES

<b>Representative</b>	<b>Position</b>	<b>Organisation</b>
Wal Merriman	Chair	AWI
Angus Beveridge	Representative	Australian Association of Stud Merino Breeders
Danny Picker	President	Australian Superfine Woolgrowers Association
Martin Oppenheimer	Representative	Australian Wool Growers Association
Nick Cole	Representative	Broad wool breeds
Clinton Ayers	Representative	Pastoralists and Graziers Association of Western Australia
Richard Halliday	President	WoolProducers Australia
John Ferrier (Guest Participant)	Vice Chair	Birchip Cropping Group
Robert Pocock (Guest Participant)	Representative	Mallee Sustainable Farming Group
Andrew McDonald	Assistant Secretary	Department of Agriculture and Water Resources
Stuart McCullough	CEO	AWI
Peta Slack-Smith	General Manager Corporate Affairs & Market Access	AWI
Emma Gittoes	Corporate Affairs Manager	AWI

# ICC MEETING PACK

## FEBRUARY 2018



# ITEM 1:

## WELCOME AND GENERAL BUSINESS

**1.1 Review minutes from previous meeting - Tab 4 (p.101)**

**1.2 Review actions from last meeting – AWI and ICC members  
to report back**



# ACTION ITEMS FROM 12 OCTOBER 2017 MEETING

ACTION ITEM	STATUS	COMMENT
AWI to organise session with marketing team at next ICC meeting to explain AWI's marketing activities, including the expectations, outcomes and benefits.	Completed.	Added to next Sydney meeting agenda due to logistics.
AWI to provide demonstration of microwave technology at next ICC meeting in Sydney.	Completed.	Added to next Sydney meeting agenda due to logistics.
ICC members to write joint letter to AWEX to raise wool classing issues and line preparation questions directly.	In progress.	Letter drafted and circulated to ICC members with February meeting agenda on 7 February. Draft letter is included at <b>Tab 2 (p49)</b> of this pack.
DAWR to report back to ICC on potential for national approach to OJD.	In progress.	Update to be provided at February ICC meeting.
Livestock SA to share a copy of SA's regulations on the National Standards and Guidelines.	Completed.	Sent by AWI to ICC members on 30 October 2017.
AWI to provide further detail on the milestones of AWI's Artificial Insemination project.	Completed.	Sent by AWI to ICC members on 30 October 2017. A copy of is included at <b>Tab 2 (p51)</b> of this pack.
AWI to circulate a form through which ICC members can declare what committees they sit on and positions they hold in other organisations.	Completed.	Sent by AWI to ICC members with February meeting agenda on 7 February. Finalised form is included at <b>Tab 2 (p53)</b> of this pack.
AWI to talk with WASIA regarding their shearing shed audit project proposal, however with a slight shift in scope from undertaking audits on farms, to helping growers prepare their sheds for audits.	Completed.	AWI met with the Chair and CEO of WASIA to discuss the project proposal. WASIA were encouraged to resubmit a project proposal with a revised view to making it an industry-wide initiative that has the capacity for national roll-out and a train-the-trainer component. Once received, AWI will review the project proposal as per its normal process.
AWI and ICC members to seek feedback from their organisations on WPA's proposal to reform AWI's ICC and revert at the next meeting.	In progress.	For discussion at February ICC meeting. A copy of is included at <b>Tab 2 (p53)</b> of this pack.
AWI to circulate updated breech flystrike strategy to AWI's Animal Welfare Forum participants (which include ICC members).	Completed.	Sent by AWI to all AWI Animal Welfare Forum participants on 6 November 2017. A copy of the strategy is included at <b>Tab 2 (p56)</b> of this pack.
AWI to include in the next Beyond the Bale WPA's new drug policy poster for sheds.	In progress.	Awaiting WPA and working group to finalise the poster.

# ITEM 2:

## ICC MEMBERS REPORT ON THEIR MEMBERS' R&D AND MARKETING PRIORITIES FOR AWI

Priorities identified previously can be found at Tab 3 (p. 57) of this pack



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# AASMB PRIORITIES FOR AWI



*ROLE OF ORGANISATION: AASMB aims are to encourage, promote and foster the breeding and improvement of Merino and Poll Merino stud sheep, and to publish a register of these sheep in Australia.*

**Priorities for AWI (to be provided):**

**Priorities for the wool industry (to be provided):**





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# ASWGA PRIORITIES FOR AWI



*ROLE OF ORGANISATION: ASWGA represents a collaboration of membership of growers and their special global processor and manufacturing members, while providing a direct link between superfine growers and their customers, and the opportunity to create transparency throughout the supply chain.*

**Priorities for AWI (to be provided):**

**Priorities for the wool industry (to be provided):**



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# AWGA PRIORITIES FOR AWI



*ROLE OF ORGANISATION: AWGA was formed to represent wool growers and be a strong and independent voice. AWGA has been set up on a national platform to give wool growers and industry members direct and easy representation to AWI, governments, media and through the wool industry pipeline.*

**Priorities for AWI (to be provided):**

**Priorities for the wool industry (to be provided):**



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# BROAD WOOL PRIORITIES FOR AWI



*ROLE OF ORGANISATION: The Australian Corriedale Association represents broad wool breeds and consults with groups such as the Australian Stud Sheep Breeders Association.*

**Priorities for AWI (to be provided):**

**Priorities for the wool industry (to be provided):**



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# PGA PRIORITIES FOR AWI



*ROLE OF ORGANISATION: PGA aims to ensure the prosperity and long term viability of members, the agricultural and associated industries, by providing an effective voice statewide and federally through a financially sound, efficient, free enterprise organisation with strong leadership.*

**Priorities for AWI (to be provided):**

**Priorities for the wool industry (to be provided):**



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# WPA PRIORITIES FOR AWI



*ROLE OF ORGANISATION: WPA plays a key role in working with organisations that are financed by grower funds - whether they are compulsory levies or fees for service - to develop constructive and profitable outcomes for industry.*



**Priorities for AWI (to be provided):**

**Priorities for the wool industry (to be provided):**

# BIRCHIP CROPPING GROUP



*ROLE OF ORGANISATION: WPA plays a key role in working with organisations that are financed by grower funds - whether they are compulsory levies or fees for service - to develop constructive and profitable outcomes for industry.*

**Priorities for AWI (to be provided):**

**Priorities for the wool industry (to be provided):**



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# MALLEE SUSTAINABLE FARMING GROUP



*ROLE OF ORGANISATION: WPA plays a key role in working with organisations that are financed by grower funds - whether they are compulsory levies or fees for service - to develop constructive and profitable outcomes for industry.*



**Priorities for AWI (to be provided):**

**Priorities for the wool industry (to be provided):**

# R&D PRIORITIES IDENTIFIED IN AWI'S CONSULTATION AND INTEGRATION INTO AWI'S AOP 2017/18

ICC members' priorities identified	Priorities identified in other grower consultation	Integration of these priorities in AWI's AOP 2017/18
<ul style="list-style-type: none"> <li>• Animal welfare</li> <li>• Flystrike</li> <li>• Wild dog and other vertebrate pest control</li> <li>• Diseases – ovine brucellosis, foot rot, OJD</li> <li>• Lice</li> <li>• Expanding LTEM program</li> <li>• Genetics and genomics</li> </ul>	<ul style="list-style-type: none"> <li>• Lamb survival</li> <li>• Reproduction</li> <li>• Weaner management and early weaning</li> <li>• Wild dogs – fencing, baiting</li> <li>• Diseases – ovine brucellosis, footrot</li> <li>• Paraboss – lice, worms and flies</li> <li>• Pain relief</li> <li>• Animal health and nutrition</li> </ul>	<p><b>Strategy : Healthy Productive Sheep go to pg 31</b></p> <ul style="list-style-type: none"> <li>• Program: Sheep Health &amp; Welfare</li> <li>• Program: Vertebrate Pests</li> <li>• Program: Reproduction</li> <li>• Program: Genetics</li> </ul>
<ul style="list-style-type: none"> <li>• On-farm technology</li> <li>• Ear tag technology</li> </ul>	<ul style="list-style-type: none"> <li>• On-farm technology</li> <li>• eIDs</li> <li>• Water monitoring</li> </ul>	<p><b>Strategy : Farm Automation &amp; Software Development go to pg 33</b></p> <ul style="list-style-type: none"> <li>• Program: Software Development</li> <li>• Program: Hardware Development</li> </ul>
<ul style="list-style-type: none"> <li>• Wool Exchange Portal (WEP)</li> <li>• Increase in shearer and shed handler numbers</li> <li>• Shed safety training</li> <li>• Shearing alternatives</li> <li>• More wool classers and better training</li> <li>• Lower costs of production</li> <li>• Enticing young people into the industry</li> <li>• Improving grower consultation</li> </ul>	<ul style="list-style-type: none"> <li>• Shearing alternatives</li> <li>• Flexibility in clip preparation</li> <li>• Tools and guidance on yard design/infrastructure</li> <li>• Sheep handling efficiency and training</li> <li>• Training for new entrants in the industry</li> <li>• Wool Exchange Portal (WEP)</li> <li>• Business management</li> <li>• Supply chain and market knowledge</li> </ul>	<p><b>Strategy : Training &amp; Technology Uptake go to pg 39</b></p> <ul style="list-style-type: none"> <li>• Program: Wool Harvesting &amp; Quality Preparation</li> <li>• Program: Sheep &amp; Wool Management Skills</li> <li>• Program: Market &amp; Trade Intelligence</li> <li>• Program: Student Education</li> </ul>
<ul style="list-style-type: none"> <li>• Research into wool's eco-credentials</li> <li>• Fibre advocacy</li> <li>• Life Cycle Assessment (LCA)</li> <li>• Climate change</li> </ul>	<ul style="list-style-type: none"> <li>• Feedbase education</li> <li>• Soil and pasture health</li> <li>• Feedlotting</li> <li>• Dry time feeding</li> <li>• Water security</li> </ul>	<p><b>Strategy : Feedbase &amp; Fibre Advocacy go to pg 34</b></p> <ul style="list-style-type: none"> <li>• Program: Fibre Advocacy</li> <li>• Program: Feedbase &amp; Eco Credentials</li> </ul>
<ul style="list-style-type: none"> <li>• Dominance of China</li> </ul>	<ul style="list-style-type: none"> <li>• Chlorine in early stage processing</li> </ul>	<p><b>Strategy : Product &amp; Processing Innovation go to pg 45</b></p> <ul style="list-style-type: none"> <li>• Program: Process Development</li> <li>• Program: Product Development</li> </ul>
<ul style="list-style-type: none"> <li>• Retailer training</li> </ul>	<ul style="list-style-type: none"> <li>• Educating students on industry practices</li> </ul>	<p><b>Strategy : Education &amp; Extension go to pg 46</b></p> <ul style="list-style-type: none"> <li>• Program: Trade Education</li> <li>• Program: Student Education</li> </ul>



# ITEM 3:

## ICC MEMBER AGENDA ITEMS – REQUEST FOR BRIEFING FROM AWI ON ISSUES

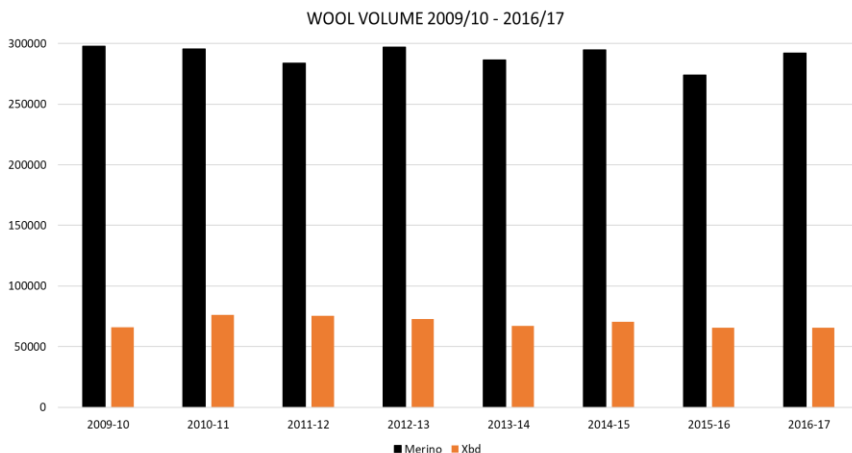


# BROAD WOOL - Multiple Items Raised

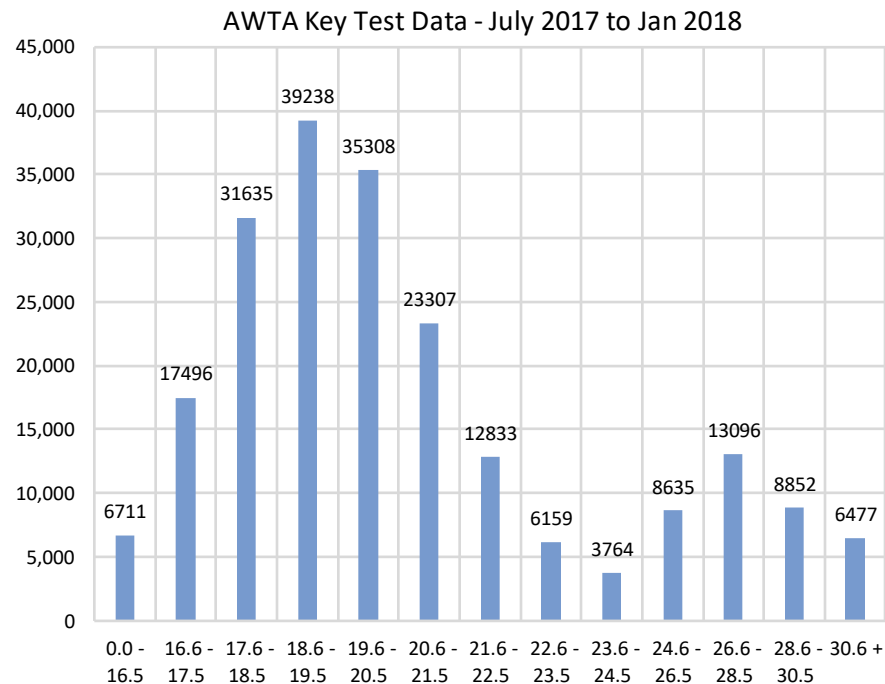


## Percentage of the levy collected from broad wool

- Since 2009/10 the proportion of Merino to Broader wool (including xbd) has remained relatively consistent with approximately 20% of Australian wool being broad micron (>23.5 micron) (see graph below).
- Based on AWEX production and prices reported in the 2017/18 season to date, AWI measured that non-Merino broad wool represents a value of 9.8% of wool GVP.
- The latest AWTA Key Test Data shows this trend is continuing in the 2017/18 season (see graph to right).



- Further information can be found here: [https://www.wool.com/globalassets/start/market-intelligence/monthly-market-report/awi\\_monthlymarketreport\\_nov17.pdf](https://www.wool.com/globalassets/start/market-intelligence/monthly-market-report/awi_monthlymarketreport_nov17.pdf)



# BROAD WOOL - Multiple Items Raised

## *AWI investment in marketing and product/processing innovation of broad wool*

- AWI supports marketing of wool for interiors through its investment in the Campaign for Wool.
- A major new area that AWI – through its subsidiary The Woolmark Company (TWC) - has been working in to promote the benefits and use of wool is the automotive interiors space. TWC works closely with leading global, luxury car brands (such as BMW and Land Rover) and key supply chain partners, such as yarn suppliers (Schoeller, Suedwolle and Lincspun) as well as weavers (such as Chia Her), who are actively developing and producing innovative yarns and fabrics for this space.
- TWC also cooperates with fabric and seat supplier, AUNDE, at key global automotive roadshow events. These events are interactive, showcasing new automotive fabrics, the AUNDE collection, products and ISRI seats as well as wool and wool fabrics. TWC also works with AUNDE to present the benefits of wool to leading car manufacturers around the world to promote wool and encourage its use in the car interior sector.



# BROAD WOOL - Multiple Items Raised



## *AWI investment in marketing and product/processing innovation of broad wool*

Examples of car brands including wool in their interiors as a result of TWC collaborations include:

### **MINI**

- The Woolmark Company x MINI partnership announced for 2018.
- The partnership will see the creation of a wool capsule collection, designed by a series of up-and-coming fashion designers and co-developed by The Woolmark Company and MINI.
- The collection will be unveiled at Pitti Uomo 94 in Florence this June.

### **BMW**

- The new version of the fully electric BMW i3 model has a new wool blended fabric option in 40% wool (26 – 28 mic.)
- TWC have a Marketing Collaboration Agreement with BMW through the close work TWC do with AUNDE.

### **Land Rover**

- The new Range Rover Velar is available with an innovative wool blend interior, which Land Rover says is the first ever non-leather premium interior option on a volume-manufactured model.

# WPA - Multiple Items Raised

## *Results of AWI's consultation review*

In 2016/17, AWI focused on improving the effectiveness of its consultation with woolgrower representative groups. AWI undertook extensive work to develop a new Consultation Plan, seeking feedback from the Australian Government and AWI's ICC.

As part of its ongoing consultation work to ensure AWI meets growers expectations, AWI commissioned a survey of growers . The study involved a review of AWI's communications documents and consultations with a select number of AWI's stakeholders.

### Key findings were:

- AWI's communications activities are as good as those of any rural research & development corporation, and engagement activities are generally well regarded.
- AWI was perceived by growers surveyed to be the organisation that assists them best to improve their profitability and reports back most effectively.
- AWI and AWI extension networks are rated as those industry organisations who contribute most to woolgrower profitability.
- There is a high level of awareness and/or use amongst growers surveyed of AWI's RD&E programs (72%) and marketing campaigns (84%).
- As AWI's formal consultation forum, ICC members surveyed agree it has improved considerably over the last 12-18 months. However, there remains a level of suspicion that AWI is 'going through the motions' with the ICC rather than genuinely seeking its input, noting there is greater scope for AWI to explain how member issues are considered and integrated within the business.
- Several ICC members described the current ICC meeting notes as 'beige' or 'bland', suggesting 'AWI can do no wrong', with a common view that the notes could be improved. It was noted that through the SFA, DAWR requires AWI to provides "responses to issues raised" to ensure ICC members are well informed of AWI activities.

# WPA - Multiple Items Raised

## *Results of AWI's consultation review - continued*

### Key areas identified for improvement:

- Continue to make improvements to the functioning and conduct of the ICC, where possible. Good progress has been made but this needs to continue.
- AWI staff and directors must be extremely careful to listen the contributions of ICC members, and to respectfully respond to them, even when statements are made or questions asked that have been fully addressed on previous occasions.
- Publish more comprehensive meeting notes that capture specific comments and identify them to individuals.
- Ensure meeting notes are distributed to members and/or published in a timely manner.
- Consider appointing an AWI woolgrower director as chair of the ICC. It would help to reduce misperceptions that the ICC is 'overseeing' the Board – which is not the role of the ICC – if the principal conduit between the Board and ICC were to be one of the directors other than the AWI Chair.
- Continue to implement the other elements of AWI's consultation plan, which are well thought out and will significantly strengthen AWI's efforts in this area.

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# WPA - Multiple Items Raised



## *AWI Review of Performance 2018*

- AWI and DAWR will provide an update on this item at Agenda items 5 and 4 respectively.

# WPA - Multiple Items Raised



## *AWI's constitution and conduct of AWI Director elections*

- Following the issues that have recently been raised, the AWI Board has been considering current company practices in relation to publishing details of proxies at Director elections.
- When looking at AWI's company practices, the Board is very conscious of AWI's unique position as the prescribed research and development body for the wool industry in considering how it can most appropriately respond to the concerns of AWI shareholders.
- The Board is reviewing what is required of companies under the Corporations Act and what is recommended to companies through the ASX Corporate Governance Principles, along with what is required of AWI under the Statutory Funding Agreement (SFA).
- As per AWI's Constitution (clause 3), a special resolution passed by at least 75% of votes cast by shareholders, is required to change the Constitution.



# WPA - Multiple Items Raised



## *Investigation into missing ballot papers from 2017 AGM*

- During the 2017 AGM, AWI were made aware that some shareholders hadn't received their voting materials. On 8 November 2017, AWI emailed shareholders reminding them that they could lodge their vote online. AWI also directly contacted those who reported that they had not had not received voting materials, and sent a replacement proxy form by email to enable them to lodge their vote.
- After the election, AWI launched an investigation to understand the extent and consequence of mailing issue in the 2017 AGM.
- As part of the investigation, AWI placed newspaper advertisements inviting affected persons to contact us. This was done twice, in the week commencing 6th December and again in the week commencing 20th December. A dedicated email box was set up for responses to be sent to us. We received a list of affected persons from WoolProducers Australia after they liaised around their affiliated organisations (66 persons) and a list from Livestock SA (16 persons – all bar 1 of them were also on the WPA list). Additional responses from the advertisements brought the total of purportedly affected persons to 83.
- The results of the investigation will be publicised to shareholders via an article in “Beyond the Bale” and a podcast interview on “The Yarn”. AWI will ensure that the results are circulated to ICC members once they are available.

## *Update on AWI's AI investigation work*

An update on AWI's Artificial Insemination work was provided after the last ICC meeting on the 30<sup>th</sup> October, 2017. A further update has also been included in this pack at **Tab 3 (p63)**.

## *Supply, demand and fibre advocacy for superfine wool*

- As our levy comes from all Australian woolgrowers, AWI does not support one wool type over another. We recognize the market forces at play and by supplying market intelligence, we hope that growers can make informed decisions on their production from that information. Wool brokers are in a better position to provide advice on demand for different wool types from the exporters.
- AWI has been investing significantly in a range of fibre advocacy programs to increase demand for superfine Merino wool (see the list of projects in the table below). A primary goal of these studies is to build markets for high value base layer garments, which by default must comprise superfine wool in order to feel comfortable when worn directly against the skin. In particular, this work has focused on wool's benefits for skin health, sleep health and addressing barriers to adoption of base layer garments for military and emergency services.
- A parallel and complimentary activity has been our work to debunk the 'myth' that wool is a skin allergen. This publication, by an esteemed group of dermatologists and immunologists in a high-ranked dermatological journal, together with AWI's associated marketing initiatives, including press releases, videos and factsheets, to spread the word, will go a long way towards overcoming strongly held misperceptions by the public that they are allergic to wool and unable to wear it against the skin.



## *Research into highly resistant and susceptible sheep for breech flystrike*

- There is no one-size-fits-all sheep breeding program, and breeding strategies need to be customised to the individual farm. There is also no one single factor that causes flystrike, hence the importance of a comprehensive R&D strategy.
- Since 2005 AWI has identified five key genetic traits of flystrike, their heritability and correlations. Those genetics traits are dags, breech wrinkle, urine stain, breech cover and wool colour.
- AWI has developed ASBVs for each of these five key traits to assist growers in their endeavours to breed sheep that are less susceptible to flystrike.
- AWI is currently looking at creating a faecal consistency ASBV from existing data, and are also looking at the role that genomic information may play in improving ASBVs. AWI is reviewing its ongoing investment strategy to focus on identifying more risk or protective factors in the hope that additional sheep traits can be identified, for which ASBVs can be created (one lead being sheep odour).
- The variation in the incidence of flystrike is mostly from unknown causes (64% is unknown in un-crutched hoggets).
- AWI continues to look into a range of areas to account for the unknown factors, one such example is odour.
- AWI recently approved a genome wide association study to identify gene markers for breech strike risk and protective traits.

# ASWGA - Multiple Items Raised

## *Communicating genetic research to woolgrowers*

- Woolgrowers can access information through SheepGenetics, which was set up by AWI and MLA and is now wholly funded by MLA. SheepGenetics contains information linking to a range of tools available to growers, including AMSEA, bloodline wether trials, Ram Select and more.
- AWI's state-based Extension Networks engage over 9,000 woolgrowers nationwide. Through this network, AWI promotes workshops and calendar events associated with a range of AWI and broader industry events. The networks also promote the different tools that have been developed for woolgrowers (not just AWI tools).
- Woolgrowers can access extension networks nationwide:
  - Sheep Connect NSW [www.sheepconnectnsw.com.au](http://www.sheepconnectnsw.com.au)
  - BEST WOOL/BEST LAMB VIC <http://agriculture.vic.gov.au/agriculture/livestock/beef-and-sheep-networks/bestwool-bestlamb>
  - The Sheep's Back WA [www.sheepsback.com.au](http://www.sheepsback.com.au)
  - Sheep Connect SA [www.sheepconnectsa.com.au](http://www.sheepconnectsa.com.au)
  - Leading Sheep QLD [www.leadingsheep.com.au](http://www.leadingsheep.com.au)
  - Sheep Connect TAS [www.sheepconnecttas.com.au](http://www.sheepconnecttas.com.au)

# ASWGA - Multiple Items Raised

## ***Communicating genetic research to woolgrowers – continued***

- AWI balances its investment across a range of objective and subjective genetics tools and programs to assist growers, with around 70% invested in ‘objective’ sheep breeding and 30% invested in ‘subjective’ sheep breeding.
- Key projects include:
  - Merino Lifetime Productivity (75% objective, 25% subjective)
  - Review of Visual Scores (100% objective)
  - Practical Sheep Classing Skills (100% subjective)
  - National Merino Challenge (50% objective, 50% subjective)
  - Sire Evaluation (100% objective)
  - Selecting Sheep Resource Limited Environment (100% objective)

- The following table was presented at AWI’s Annual General Meeting in November 2017, showing the proportion of investment in objective and subjective sheep breeding research, development and extension for 2017/18:

PROGRAM	OBJECTIVE BUDGET	SUBJECTIVE BUDGET	TOTAL
Genetics	1,452K	371K	1,824K
Wool Grower Services	133K	263K	395K
TOTAL	1,585K	635K	2,219K
% Budget Spend	71%	29%	

- AWI undertakes research, develop the tools, provides education opportunities and communicates what is available, however it is up to individual growers to adopt what they feel is best for their business.

# ASWGA - Multiple Items Raised

## *Understanding availability of shearing and shed-hand staff*

- AWI could look into a survey of available, qualified shed labour for the wool industry. ASWGA is encouraged to contact Stephen Feighan ([Stephen.Feighan@wool.com](mailto:Stephen.Feighan@wool.com)) AWI's General Manager – Woolgrower Services, to discuss this proposal further.
- AWI is actively working to address grower concerns around the cost and availability of shearers and woolhandlers:
  - AWI invests around \$2 million annually to attract and retain shearers and woolhandlers by building capacity through training, improving working conditions through best practice OH&S and shed design, and promoting shearing and woolhandling as a profession and sport through competitions.
  - AWI is currently in discussions with Shearing Contractors Association about a project proposal to create ongoing local employment and training to strengthen the wool harvesting industry in Victoria.
  - AWI is continuing discussions with the Labour Mobility Assistance Program Reference Group to ascertain whether seasonal workers under the Seasonal Workers Programme would be suitable for the wool harvesting industry.
  - AWI is also working in the alternative wool harvesting technology space, with the ultimate aim of alleviating any shortages. AWI is currently investigating a proposal to develop a fully automated wool harvesting system.



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# ASWGA - Multiple Items Raised



## *Request for research into the development of 'cost effective' mechanised sheep handling equipment*

- AWI invests in areas where there is market failure. As there are currently many options already on the market in the mechanised sheep handling equipment space, AWI's investment focus is instead in industry training and retention, and new wool harvesting technology.

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# ASWGA - Multiple Items Raised



## *Alternative wool harvesting methods and re-visiting BioClip*

- As AWI has highlighted to ICC members at meetings last year, alternative wool harvesting technology is a major focus of the AWI Board and that AWI will be investing more in this area, consistent with its Strategic Plan. As part of this, AWI is currently investigating a proposal to develop a fully automated wool harvesting system.
- AWI has recently also been in discussion with Heiniger Ltd regarding the commercialisation of BioClip.

# ASWGA - Multiple Items Raised



## *Impact of feral animals, and growing issue with deer*

- AWI has prioritized predation from pests for its investment, as opposed to grazing pressure, as wild dogs have been known to destroy an enterprise within a few years of intense predation. AWI invests in projects with the Centre for Invasive Species Solutions (CISS) that align with AWI's Strategic Plan.
- AWI has been helping growers to tackle wild dogs in Queensland, through wild dog control groups and investment in fence construction machinery. As a secondary benefit of cluster fencing for these growers, they have been able to gain greater control over “total grazing pressure” on their property.
- AWI continues its rabbit research investment through the Centre for Invasive Species Solutions (CISS). AWI's investment is specifically targeted at the development of current and future biological controls for rabbits. In an effort to significantly reduce pest rabbit populations and their negative impact on agricultural production and native ecosystems, a new virus known as RHDV1 K5 was released at more than 600 sites across Australia in March 2017. With funding from AWI and the Invasive Animals CRC, community organisations, Landcare groups and government land managers participated in the national roll-out of the new virus. The virus enhances conventional rabbit control activities, with AWI also funding the production of ten new instructive videos to help woolgrowers with biocontrol and conventional control of rabbits. Preliminary reports have shown significant benefits for woolgrowers, with a 42% average reduction in rabbit numbers at sites where the strain was released (above the predicted 10-40%).
- AWI understands that kangaroos also pose a serious problem through their contribution to over-grazing and that deer are impacting beyond Tasmania, with increasing investment from Victorian and NSW governments going into research and control (despite some state governments retaining game status for deer). During the researcher negotiations for the CISS, government investment was re-distributed from wild dogs into deer. AWI can offer to keep the ICC up to date with deer research through its CISS contacts if needed. Furthermore, there are policy issues that need to be resolved by state governments around the status of the species as ‘game’ or ‘pest’ animal.

# ITEM 4:

## UPDATE FROM DEPARTMENT OF AGRICULTURE, WATER AND RESOURCES

To include report back on potential for national approach to  
OJD and Ovine Brucellosis

# ITEM 5:

## AWI REPORT BACK – ANNUAL WELFARE UPDATE AND REVIEW OF PERFORMANCE

*Invite discussion and input*



# ITEM 6:

## AWI REPORT BACK – ON FARM R&D

*Invite discussion and input*



# ITEM 7:

## AWI REPORT BACK – UPDATE ON WOOLPOLL 2018

*Invite discussion and input*



# ITEM 8:

## AWI REPORT BACK - CURRENT FINANCES

*Invite discussion and input*





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# UPDATE ON FINANCES



Presentation to be provided by Chief Financial Officer at the meeting.

# PROGRESS ON IMPLEMENTING AWI'S AOP



The following pages provide information on AWI's progress in implementing AWI's Strategic and Annual Operating Plans.

For each target, AWI has developed the following descriptors to outline progress:

- **Achieved:** the deliverable/s listed in the AOP have been fully completed for this financial year as outlined in the AOP
- **On Target:** activity and operation regarding the deliverable/s listed in the AOP are on-track and being implemented as planned without any delays,
- **In Progress:** activity and operation regarding the deliverable/s listed in the AOP are on-track and being implemented **and may have/ or is likely to have delays** in terms of timing, budget or output

# SHEEP PRODUCTION DELIVERABLES 2017/18

OVERALL OBJECTIVE		Increase the profitability and sustainability of woolgrowing.	
STRATEGY	PROGRAMS	DELIVERABLES / TARGETS	STATUS
Healthy Productive Sheep	SHEEP HEALTH & WELFARE	<ol style="list-style-type: none"> <li>1. Pre-operative pain relief available for routine surgical procedures.</li> <li>2. Breech modification alternatives commercialised.</li> <li>3. Development of an ASBV for faecal consistency.</li> <li>4. Improved laboratory diagnostic testing for worms and larvae.</li> <li>5. Sustained increase in grower utilisation of the ParaBoss website.</li> <li>6. Wool bale decontamination and disinfection procedures developed.</li> </ol>	<ol style="list-style-type: none"> <li>1. In progress.</li> <li>2. In progress.</li> <li>3. In progress.</li> <li>4. In progress.</li> <li>5. In progress.</li> <li>6. In progress.</li> </ol>
	VERTEBRATE PESTS	<ol style="list-style-type: none"> <li>1. Effective national and regional coordination of vertebrate pest control effort in sheep producing areas.</li> <li>2. Effective assistance to producer groups to establish the basis for sustainable long-term vertebrate pest control programs.</li> <li>3. At least 200 community based vertebrate pest control groups established each year, bringing to a total of 165 group supported by end 2018/19, with the value of avoided stock loss (sheep) greater than costs to wool growers and AWI combined.</li> <li>4. Support for programs which enhance producers ability to efficiently and effectively control Rabbits in the long term.</li> </ol>	<ol style="list-style-type: none"> <li>1. In progress – some delays.</li> <li>2. On target.</li> <li>3. On target.</li> </ol>
	REPRODUCTION	<ol style="list-style-type: none"> <li>1. An extra 1500 AWI-funded participants in LTEM (500 per annum), representing 15% of the adult ewe flock in Australia, that increase lamb weaning rates by 7%, and reduce ewe mortality by 30%.</li> <li>2. At least 250 producers engaged in determining the impact of lambing density (ewe mob size and stocking rate) on lamb survival.</li> <li>3. At least 200 producers engaged in developing the strategies and guidelines for improving weaner and maiden ewe performance .</li> <li>4. Undertake market research on a range of producer and industry segments to inform; (i) strategies that enhance producer engagement, (ii) design/pilot extension approaches that increase adoption of best practice, (iii) more thorough evaluation of whole farm impacts of LTEM, and (iv) quantify the degree and reasons for Merino ewe displacement.</li> </ol>	<ol style="list-style-type: none"> <li>1. On target.</li> <li>2. In progress – some delays.</li> <li>3. In progress.</li> <li>4. In progress.</li> </ol>
	GENETIC IMPROVEMENT	<ol style="list-style-type: none"> <li>1. At least 3,800 Merino ewe progeny being evaluated for lifetime productivity across at least 5 regionally representative sites, in partnership with Australian Merino Sire Evaluation Association.</li> <li>2. Routine, low-cost per head alternatives to genomic parentage technology in wide commercial use for mothering-up Merino lambs.</li> <li>3. Australian sheep breeders maintain access to consolidated and improved wether trial, central test sire evaluation and MERINOSELECT databases.</li> </ol>	<ol style="list-style-type: none"> <li>1. On target.</li> <li>2. On target.</li> <li>3. On target.</li> </ol>
Farm Automation & Software Development		<ol style="list-style-type: none"> <li>1. Develop and demonstrate across sheep production systems smart sheep ear tags capable of generating maternal pedigree, auto matic geo-location, and welfare alerts, and integrating with virtual fencing advances.</li> <li>2. Assess and improve the understanding and application of data collected by sensor technology.</li> <li>3. Develop software to maximise benefits of sensor technology for farmers.</li> </ol>	<ol style="list-style-type: none"> <li>1. In progress.</li> <li>2. In progress.</li> </ol>
Feedbase & Fibre Advocacy	FEEDBASE & ECO-CREDENTIALS	<ol style="list-style-type: none"> <li>1. Generate significant improvement in wool's environmental footprint ratings, and strengthen wool's reputation for environmental stewardship.</li> <li>2. Through better understanding of constraints to grower investment in pasture renovation, increase adoption of beneficial feedbase practices with currently modest adoption rates – reaching 20% of all growers by 2018.</li> <li>3. Prepare woolgrowers for the effects of climate change - by 2019, 50% of woolgrowers will have implemented climate change mitigating or adapting technologies without loss of profit.</li> </ol>	<ol style="list-style-type: none"> <li>1. In progress.</li> <li>2. In planning phase</li> <li>3. In planning phase</li> </ol>
	FIBRE ADVOCACY	<ol style="list-style-type: none"> <li>1. Internationalize studies demonstrating that Merino base-layer garments ameliorate chronic skin conditions associated with microclimate management of the skin.</li> <li>2. Demonstrate that wool bedding and sleepwear improves sleeping conditions.</li> <li>3. Support development of product market opportunities in categories such as corporate wear, safety wear, medical product and infants wear.</li> <li>4. Develop specifications for next-to-skin wear to improve reliability and consumer confidence in Merino baselayer garments.</li> </ol>	<ol style="list-style-type: none"> <li>1. On target.</li> <li>2. On target.</li> <li>3. On target.</li> <li>4. On target.</li> </ol>

# WOOLGROWER SERVICES DELIVERABLES 2017/18

OVERALL OBJECTIVE		Increase the profitability and sustainability of woolgrowing.	
STRATEGY	PROGRAMS	DELIVERABLES / TARGETS	STATUS
Training & Technology Update	SHEEP & WOOL MANAGEMENT SKILLS	<ol style="list-style-type: none"> <li>Over 10 practical sheep skills training events held across the country each year, reaching over 100 people and at an average cost not exceeding \$150 per effective participant.</li> <li>Delivery of the National Merino Challenge on a fixed annual budget in real terms.</li> <li>Average annual cost saving to woolgrowers participating in AWI supported networks exceeds \$700, net of AWI and grower costs.</li> <li>Achievement of a minimum of 8,000 page views for practical sheep management resources on AWI websites at a maximum cost per hit of \$1.50</li> </ol>	<ol style="list-style-type: none"> <li>On target.</li> <li>On target.</li> <li>Ahead of target</li> <li>Ahead of target .</li> </ol>
	WOOL HARVESTING & QUALITY REPARATION	<ol style="list-style-type: none"> <li>Increase shed productivity by, on average, four sheep per day by 2019 across the whole industry.</li> <li>Cost per person trained remains constant in real terms.</li> <li>Commercial availability of at least one technology, by 2019, to increase the efficiency of wool harvesting.</li> </ol>	<ol style="list-style-type: none"> <li>On target.</li> <li>On target.</li> <li>On target.</li> </ol>
Consultation	WOOLGROWER	<ol style="list-style-type: none"> <li>Provide multiple channels for shareholders to access and consult AWI directly, in person at specific and industry events or digitally</li> <li>A greater awareness amongst shareholders of the ongoing research, development and marketing projects conducted by AWI for the wool industry</li> <li>Provide a more customised flow of information to and from shareholders, delivered regularly and digitally through Beyond the Bale quarterly and newsletters monthly</li> <li>Create the most valued market intelligence in the wool industry</li> </ol>	<ol style="list-style-type: none"> <li>On target.</li> <li>On target.</li> <li>On target.</li> <li>On target.</li> </ol>
	STAKEHOLDER	<ol style="list-style-type: none"> <li>AWI reports on and meets its statutory requirements.</li> <li>Measure change in growers' awareness of AWI's activities and outcomes delivered, and build internal awareness of stakeholders' priorities and issues to better enable AWI to integrate and reflect their issues in activities.</li> <li>A greater awareness amongst stakeholders (grower groups, government, welfare stakeholders) of the ongoing research, development and marketing conducted by AWI for the wool industry and the value this delivers.</li> </ol>	<ol style="list-style-type: none"> <li>On target.</li> <li>On target.</li> <li>On target.</li> </ol>

# BUSINESS SERVICES DELIVERABLES 2017/18

OVERALL OBJECTIVE		To enable AWI to operate cost effectively through the efficient provision of a range of cross-company support services.	
STRATEGY	PROGRAMS	DELIVERABLES / TARGETS	STATUS
Corporate Services	<b>FINANCE SERVICES</b>	<ol style="list-style-type: none"> <li>1. Compliance – no default notices for financial reporting.</li> <li>2. Risk – Manage the group reserves policy ensuring the reserves are maintained to target.</li> <li>3. Provide financial reports to the Board/management and audited financial statements.</li> </ol>	<ol style="list-style-type: none"> <li>1. On target.</li> <li>2. On target.</li> <li>3. On target.</li> </ol>
	<b>PEOPLE SERVICES</b>	<ol style="list-style-type: none"> <li>1. Talent Acquisition – talent recruited matches business needs</li> <li>2. Engagement – Year on year improvement in employee engagement measure</li> <li>3. Workplace Culture – Compliance with local and international employment legal requirements and key HR policies globally.</li> </ol>	<ol style="list-style-type: none"> <li>1. On target.</li> <li>2. On target.</li> <li>3. On target.</li> </ol>
	<b>LEGAL SERVICES</b>	<ol style="list-style-type: none"> <li>1. Provide legal and commercial advice and support to the company in order to reflect its strategic and commercial needs as well as mitigating risks.</li> <li>2. Manage the company's intellectual property assets to ensure that they are protected and their value enhanced and provide assistance with commercialisation.</li> <li>3. Administer the affairs and corporate governance for AWI, its Board, Board Committees as well as its subsidiaries, branches and representative offices to ensure their observance of legal requirements.</li> </ol>	<ol style="list-style-type: none"> <li>1. On target.</li> <li>2. On target.</li> <li>3. On target.</li> </ol>
	<b>EVALUATION SERVICES</b>	<ol style="list-style-type: none"> <li>1. All AWI Programs will be evaluated on a routine basis.</li> </ol>	<ol style="list-style-type: none"> <li>1. On target.</li> </ol>
Woolmark	<b>LICENSING</b>	<ol style="list-style-type: none"> <li>1. Stabilise the decline in numbers of licenses.</li> </ol>	<ol style="list-style-type: none"> <li>1. In progress.</li> </ol>
	<b>BUSINESS DEVELOPMENT</b>	<ol style="list-style-type: none"> <li>1. 75% of Key Accounts report a measurable increase in wool production or sales over the strategic period.</li> </ol>	<ol style="list-style-type: none"> <li>1. In progress.</li> </ol>
Digital Services		<ol style="list-style-type: none"> <li>1. By 2019, increase the amount of new customers entering the AWI/WM digital eco-system by 20%.</li> <li>2. Integrate CRM across the entire business to improve communication.</li> <li>3. Ensure all offices and projects are fully supported digitally and increase overall staff awareness of these services.</li> <li>4. Provide leadership and guidance to ensure digital future proofing of the business.</li> </ol>	<ol style="list-style-type: none"> <li>1. Achieved.</li> <li>2. Achieved.</li> <li>3. Achieved.</li> <li>4. On target.</li> </ol>

## MARKETING DELIVERABLES 2017/18

OVERALL OBJECTIVE		Increase demand for Australian wool.	
STRATEGY	PROGRAMS	DELIVERABLES / TARGETS	STATUS
Fashion	MENSWEAR	<ol style="list-style-type: none"> <li>2.5 million kgs of new demand over this strategic period.</li> <li>6 new global partnerships.</li> </ol>	<ol style="list-style-type: none"> <li>On target.</li> <li>On target.</li> </ol>
	WOMENSWEAR	<ol style="list-style-type: none"> <li>2.0 million kgs of new demand over this strategic period.</li> <li>6 new global partnerships.</li> </ol>	<ol style="list-style-type: none"> <li>On target.</li> <li>On target.</li> </ol>
Sportswear		<ol style="list-style-type: none"> <li>20 new partners working with AWI</li> <li>2 million kgs new demand for Australian wool over this Strategic period.</li> </ol>	<ol style="list-style-type: none"> <li>On target.: Actively encouraging more projects in this area</li> <li>On Track: Actively encouraging more projects in this area</li> </ol>
Global Campaigns	INTERNATIONAL WOOLMARK PRIZE	<ol style="list-style-type: none"> <li>An additional 3.5 million kgs in new demand by 2019</li> <li>Grow the Alumni database by 60 new designers annually</li> <li>Grow media awareness and editorial coverage by \$10 million</li> <li>Grow the retailer partner network by 3 new retailers from a base of 11.</li> </ol>	<ol style="list-style-type: none"> <li>Achieved – target exceeded.</li> <li>In progress</li> <li>Achieved – target exceeded.</li> <li>On target.</li> </ol>
	THE CAMPAIGN FOR WOOL	<ol style="list-style-type: none"> <li>Additional 1.0 million kgs of new demand</li> </ol>	<ol style="list-style-type: none"> <li>In progress.</li> </ol>

## PROCESSING INNOVATION AND EDUCATION EXTENSION DELIVERABLES 2017/18

OVERALL OBJECTIVE		Increase the profitability and sustainability of wool processing	
STRATEGY	PROGRAMS	DELIVERABLES / TARGETS	STATUS
Processing Innovation		<ol style="list-style-type: none"> <li>1. Develop and commercialise 6 new processes and transfer to 15 manufacturers, yielding an average mill profit increase exceeding \$20,000 by 2019.</li> <li>2. Develop 4 innovations and transfer to 20 manufacturers, yielding an average mill profit increase exceeding \$20,000 by 2019.</li> </ol>	<ol style="list-style-type: none"> <li>1. In progress.</li> <li>2. In progress.</li> </ol>
Education Extension	STUDENT EDUCATION	<ol style="list-style-type: none"> <li>1. Directly engage participants at an average cost per effective participant of \$10.</li> </ol>	<ol style="list-style-type: none"> <li>1. In progress.</li> </ol>
	TRADE EXTENSION	<ol style="list-style-type: none"> <li>1. Operating under a fixed budget AWI will seek to generate leads at a cost (project and staff) of \$1 per lead.</li> <li>2. For our technology transfer investment we will seek to work with 45 new manufacturers by 2019, with the average profit increase per manufacturer exceeding \$20,000 annually.</li> <li>3. TWL will seek to deliver a minimum of 350 client meetings and to determine the extent to which our clients use TWL in their products.</li> </ol>	<ol style="list-style-type: none"> <li>1. In progress.</li> <li>2. In progress.</li> <li>3. In progress.</li> </ol>
	CONSUMER EDUCATION	<ol style="list-style-type: none"> <li>1. Development of train-the-trainer programs for greater and more efficient execution.</li> </ol>	<ol style="list-style-type: none"> <li>1. On Target</li> </ol>

# ITEM 9:

## AWI REPORT BACK – MICROWAVE TECHNOLOGY DEMONSTRATION

*Invite discussion and input*





# ITEM 10:

## AWI REPORT BACK – MARKETING ACTIVITIES

*Invite discussion and input*



# ITEM 11:

# SUMMARY AND CLOSE



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Mark Grave  
CEO, Australian Wool Exchange  
[info@awex.com.au](mailto:info@awex.com.au)

16 February 2017

**RE: Wool classers – training cost, quality and retention; preparing better lines**

Dear Mr Grave,

We write following a meeting of Australian Wool Innovation's (AWI) Woolgrower Industry Consultative Committee (ICC) held on the 13<sup>th</sup> October 2017, where our organisations raised concerns regarding the decline of well-skilled wool classers nationwide and are also seeking advice on preparing better lines.

Many of our collective members are expressing increasing difficulty in obtaining well-skilled wool classers and retaining their services year after year, as a result of the high cost and diminishing quality of wool classer training courses.

With the wool industry experiencing very buoyant times and sheep numbers likely to increase in the short term, it is imperative that the entire wool harvesting work force is increasing at the same pace.

We understand that most States have training courses through their respective TAFE institutions, however in some States these options are very limited and often poorly run. To add to this, cost of the courses has increased, while the course hours have been cut.

At a time when the industry needs more skilled classers, increased course costs can act as a deterrent to new entrants into the industry and the diminishing quality of classer courses is resulting in new classers not being adequately trained upon completion.

This is of great concern to our members and the issue has been raised by all industry groups at the past three meetings of AWI's ICC. At these forums, AWI has advised us that as wool classing falls under Australian Wool Exchange's (AWEX) bailiwick, we should be raising our concerns with you directly.

We note that Mr Richard Halliday, representing WoolProducers Australia on AWI's ICC, is also on AWEX's Board and has previously raised our concerns with you. We appreciate the information provided but do not feel it sufficiently addresses our concerns.

We therefore write formally to express our concerns and request that AWEX consider investigating ways of increasing the number of wool classers coming into the system and retention rates, lowering the cost of courses and improving the training quality to deliver more skilled classers to the industry.

We are also seeking advice for our members on ways to better prepare lines, noting that feedback through market reports (particularly for crossbred type wools) is that better prepared lines are selling at a premium. Any guidance you have that we can pass on to our members in this regard would be greatly appreciated.

We look forward to your response.

Yours sincerely,

Georgina Wallace  
**President, AASMB**



Danny Picker  
**President,  
ASWGA**



Robert McBride  
**Director,  
AWGA**



Nicholas Cole  
**Representative,  
ACA**



Clinton Ayers  
**Representative,  
PGA WA**



Richard Halliday  
**President,  
WPA**



**AWI – Artificial Insemination Projects – update for AASMB 23/10/2017**

<b>Project</b>	<b>Number</b>	<b>Start date</b>	<b>End date</b>	<b>Research organisation</b>
Achieving low cost (cervical) AI with frozen ram semen	ON-00252	12/02/14	31/12/18	University of Sydney
<b>Researcher name</b>	<b>Total cost to AWI</b>	<b>Co-investor</b>	<b>Co-investment amount</b>	<b>Milestones delivered</b>
Dr Simon de Graaf	\$970,985	None	NIL	8 of 11 (73%). Last milestone: APRIL 2017
<p><i>Detail</i></p> <p>Project objective – understand and identify strategies to overcome the 20% fertility of frozen/thawed semen via cervical AI through study of the interaction between sperm, seminal fluid and the female reproductive tract using proteomics (mass spectrometry), and real time in vivo imaging, sperm physiology and field fertility trials.</p> <ol style="list-style-type: none"> <li>Difference between proteins in epididymal sperm, fresh ejaculate, frozen/thawed sperm <ul style="list-style-type: none"> <li>Achieved characterised the ram proteome (727 unique protein identifications)</li> <li>Achieved identification of 22 protein differences between fresh and thawed sperm cell membranes and crossed check with libraries to identify their function</li> </ul> </li> <li>Identify protein in in seminal plasma, cervical mucous (induced and natural oestrus) <ul style="list-style-type: none"> <li>Achieved identification of 362 proteins in seminal plasma</li> <li>Achieved confirmation of no ionic concentration differences in seminal plasma</li> <li>Achieved identification of 415 proteins in cervical mucous including specifying which changed over the oestrus cycle</li> <li>Achieved quantification of the ionic concentration (Ca, Na, Mg, K, Cl) in cervical mucous over the oestrus cycle</li> </ul> </li> <li>Understand protein and functional interactions – effect of seminal plasma on sperm physiology, on survival of thawed sperm, on cervical mucous and on female tract. Understand variations in seminal plasma composition and its effects. (identify candidate potentiating proteins) <ul style="list-style-type: none"> <li>Achieved confirmation that rams differ in the post freezing sperm resilience and seminal plasma from this variation in rams differs in its effect on sperm motility (ie seminal plasma from high resilience to freezing rams can increase the motility of sperm from low resilience to freezing rams)</li> <li>Achieved identification of 5 seminal plasma proteins associated with potentiation of seminal plasma and associated understanding of their biological function</li> <li>Achieved demonstration that seminal plasma enhances the transit of sperm through the cervix by enhancing penetration of the cervical mucous and increased post thaw motility (but had no effect on fertilisation)</li> <li>Achieved identification of 52 sperm proteins associated with interaction with the cervico vaginal fluid</li> </ul> </li> <li>Identify cervical mucous proteins that interact with sperm surface</li> <li>Determine protein differences between cervical transiting sperm and non transiting sperm <ul style="list-style-type: none"> <li>Achieved identification of three membrane binding proteins found in ejaculate as candidates for interaction with cervical mucous</li> </ul> </li> <li>Test potentiating proteins in in vitro assays and in vivo imaging <ul style="list-style-type: none"> <li>Achieved supplementation of epididymal sperm with Binder of Sperm proteins prior to freezing improved sperm function after thawing (motility and velocity and cervical mucous interaction).</li> <li>Achieved demonstration of sperm motility characteristics favourable to cervical mucous penetration and egg penetration (thrashing head)</li> <li>In progress – in vitro capacitation effects of different concentrations of Binder of Sperm proteins</li> </ul> </li> <li>Field trial – not started</li> </ol>				

**AWI – Artificial Insemination Projects – update for AASMB 23/10/2017**

Project	Number	Start date	End date	Research organisation	
Improving the success of sheep AI programs	On-00488	Contract in development	1/07/19	SARDI	
Researcher name	Total Project Budget	Total cost to AWI	Co-investor	Co-investment value	Milestones delivered
Dr David Kleeman	\$442,800	\$176,000	In-Kind SARDI	\$266,800	NIL

*Detail*

Project Objective - identify factors that affect synchrony of oestrus and develop new ewe treatment protocols and management strategies to improve AI success rates.

Contract execution in process.

1. Develop and evaluate improved treatment protocol(s) for synchrony of oestrus based on control of follicle wave emergence, progesterone concentrations and progesterone clearance rates. A new synchronization protocol is expected.
  - Step 1** – determine the relationship between the stage of the follicle wave at CIDR removal and the timing of oestrus in a pen trial of 60 ewes measured by ultrasonography (follicle development), onset of oestrus (CIDR removal, eCG and teasers). The preferred stage of the follicle wave for synchrony of oestrus will be determined.
  - Step 2** – manipulate the timing of the follicle wave through various treatments (prolonged progesterone exposure (12 versus 24 days); high concentration of progesterone (one or two CIDRs); GnRH. GnRH agonist; prostaglandin; eCG; LH; FSH and estradiol at various stages of the cycle) measured by ultrasonography. Efficacy of each treatment will be determined by monitoring synchrony of oestrus.
2. Examine the effects of and interactions between body condition score, feed intake and progesterone concentrations on synchrony of oestrus (measured by teasers and ultrasonography). Develop improved management strategies for AI programs from results of a field trial.
3. Conduct a national survey on success rates of AI programs, determine the economic value of the AI industry and to identify technical issues on a regional and state basis. Data obtained will help develop new strategies to improve AI outcomes.

- The survey has commenced under the auspices of the SASMBA. The survey will focus on but not be restricted to the results of the 2016/2017 breeding season. Each participating producer will be asked if he/she is prepared to provide their flock for further observation in subsequent years – the intention is to identify a small number of flocks with either “good” or “bad” results that will facilitate “on farm” comparisons of factors that influence success rates.

- AWI has asked that veterinarians be surveyed.

4. Extend the technical advances made to the whole of industry to include wool sheep, dual purpose sheep and British breeds including through an extension package for veterinarians and sheep breeders

**ICC MEETING - 16 FEBRUARY 2018**

<b>ATTENDEE ORGANISATION</b>	<b>ICC ATTENDEE</b>	<b>Please indicate what positions/memberships you hold in other industry organisations/groups/committees</b>
Australian Association of Stud Merino Breeders	Angus Beveridge	President of the NSW Stud Merino Merino Breeders Assoc.
Australian Superfine Wool Growers' Association	Danny Picker	
Australian Wool Growers Association	Martin Oppenheimer	
Broad wool breeds	Nick Cole	
Pastoralists and Graziers Association of Western Australia	Clinton Ayers	PGA Executive committee, Member Bugs & Biology Grower Group, Director Ayers Projects P/L
WoolProducers Australia	Richard Halliday	President Woolproducers Australia, Director Australian Wool Testing Authority, Director AWEX
Malle Sustainable Farming Group	Robert Pocock	
Birchip Cropping Group	John Ferrier	Board Vice Chair BCG . Director Wirrabilla Farms. Member VFF



## Proposal for Industry Consultative Committee Reform

### **Background:**

- A. The ICC is the main AWI-industry forum for representative group consultation with AWI
- B. There are currently no prescribed protocols in the Statutory Funding Agreement (SFA) as to *how* industry consultation should take place, only that it should take place at least every six months. See section 28.2 of SFA for reference.
- C. Whilst acknowledging that there has been an improvement in the conduct of the ICC i.e. provision of briefing packs, there are various levels of dissatisfaction with the ICC as a feedback mechanism for representative wool grower groups to interact with AWI.
- D. With the agreement of ICC membership and AWI, it is proposed that the SFA be altered to increase the ICCs autonomy and formalise its processes, see detail below for proposed terms of reference. All terms are to be discussed by members.
- E. Reform of the ICC is intended as a renewed partnership with AWI and industry representative bodies and would not replace other consultative or briefing mechanisms AWI participate in.
- F. An autonomous ICC affords the AWI more credibility regarding genuine industry consultation
- G. The intention of reforms of the ICC is to improve feedback with and accountability to growers in regards to the levies they pay via the main grower representative groups.

### **Proposed Structure/Intent:**

*\*Please note, these are suggestions and any and all points are up for discussion.*

- 1. ICC reforms are not intended to replace other AWI consultation processes – these reforms are proposed to enable grower representative networks to interact with AWI in an accountable, robust manner. A truly autonomous ICC would introduce grower input and feedback into oversight of wool grower levy spend;
- 2. Meaningful reforms would ensure that the ICC would be autonomous of AWI but enable strong interaction with AWI on grower levy issues;
- 3. WoolProducers could provide staff secretariat for the new ICC committee with funding to be made available from the current resources made available to the original ICC;
- 4. AWI representative(s) would be invited to discuss with the group, amongst other things, the strategic plan, and the annual operating plan activities. The group will invite AWI to provide written and verbal updates;
- 5. Chairmanship to be decided – possibly provided by WoolProducers with the potential for it to be rolling and ballot drawn, length of tenure to be decided – each meeting period, or another length of time by agreement of the group. Group who hold chair to have additional representation present;
- 6. Continue meeting with Industry Representative Bodies as per SFA requirement, but with the provision for out-of-session teleconferences to be called for other issues if needed, with the ability of these to be called at the request of ICC members;
- 7. Other industry partners such as the Invasive Animals CRC, the Sheep CRC, would be invited to attend to report on current Research, Development and Extension to manage and reduce the incidence of duplication in RD&E in the sheep industries;
- 8. The ICC to nominate the WoolPoll Panel Chair with the assistance of secretariat of the current WoolPoll Panel for logistics;

9. The ICC to nominate independent Chair for three-year Review of Performance Project Steering Committee
10. An 'independent umpire' not from the wool or red meat industry, nor from government be made available to arbitrate on issues of process and good governance;
11. Independent Review to occur one year after institution, and then two or three yearly thereafter and be separate from AWI Independent Review;
12. The reformed ICC be adequately resourced by AWI;
13. Governance issues to be considered:
  - a. Full minutes, actions, resolutions recorded and made available, instead of the current ambiguous Record of Minutes
  - b. Declarations of interests to be made at each meeting
  - c. Agreement on the confidentiality of issues to be made on a case-by-case basis
  - d. Voting determination yet to be decided – weighted according to membership of individual organisations or other method? Vote to be determined by consensus or majority? Specific attention to be paid to this in the 1-year review to ensure fairness.
  - e. AWI to provide input into governance related issues
  - f. Should AWI get a vote at ICC? To be discussed by grower groups

# BREECH FLYSTRIKE STRATEGY 2017/18 – 2021/22

## THE FIVE KEY PILLARS OF AWI INVESTMENT

The Breech Flystrike Strategy provides direction for AWI investment in sound, scientific solutions for the management of breech flystrike to improve lifetime animal welfare, address supply chain expectations and increase the demand for Australian wool.

### BREEDING AND SELECTION

**THE AIM:** Long term sustainable solutions to reduce the risk of breech flystrike.

- Understand the performance and economic consequences of breeding for reduced breech flystrike.
- Investigate the, as yet unknown, factors that cause breech flystrike.
- Improve the accuracy and robustness of breech flystrike traits along with other welfare traits such as worm resistance and survival.
- Better understand how to reduce the incidence of dags and urine stain through breeding.

### BREECH MODIFICATION ALTERNATIVES

**THE AIM:** Breech modification alternatives to reduce the reliance on mulesing.

- Undertake further R&D to refine the application protocols for breech modification alternatives to support their commercial viability.



### IMPROVED MANAGEMENT PRACTICES

**THE AIM:** Improved management practices to advance lifetime welfare.

- Invest in getting new parasite control treatments and vaccines to market.
- Ensure access to information on parasite management and use of existing chemical treatments.
- Investigate longer acting, cost effective pain relief options for painful husbandry practices.
- Support for further National Mulesing Accreditation Program (NMAP) training.

### WOOL INDUSTRY TRAINING AND ENGAGEMENT

**THE AIM:** Adoption of best practice

sheep and reduce reliance on mulesing.

- Develop and implement education, training and extension strategies to improve lifetime welfare of sheep and reduce reliance on mulesing.
- Monitor, evaluate and improve the success of education, training and extension strategies.
- Engage with woolgrower advisors on the RD&E program.

### SUPPLY CHAIN ENGAGEMENT

**THE AIM:** International and domestic stakeholders support the Australian wool industry.

- Regularly engage with domestic and international stakeholders to ensure they understand best practice management of breech flystrike and associated welfare implications.
- Minimise the risk of regulatory measures that may restrict the ability of woolgrowers to select the most appropriate practices for their farming system.
- Consult with Australian wool and sheep industry organisations.

# AASMB PRIORITIES FOR AWI



*ROLE OF ORGANISATION: AASMB aims are to encourage, promote and foster the breeding and improvement of Merino and Poll Merino stud sheep, and to publish a register of these sheep in Australia.*

## **Previous Priorities for both AWI and the wool industry:**

- Encouraging growers to increase or reintroduce Merinos
  - Animal welfare
  - Ovine brucellosis
  - Need for basic training and encouraging young people to get into the industry – need to make sheep production easier (handling, wool harvesting)
  - Ensuring membership of ICC is truly representing woolgrowers Australia-wide
- Need for more wool classers
  - Foot rot
  - Lice
  - Encouraging members to use pain relief if mulesing
  - Improving Artificial Insemination results
  - National approach to OJD



# ASWGA PRIORITIES FOR AWI



*ROLE OF ORGANISATION: ASWGA represents a collaboration of membership of growers and their special global processor and manufacturing members, while providing a direct link between superfine growers and their customers, and the opportunity to create transparency throughout the supply chain.*

## **Previous Priorities for both AWI and the wool industry:**

- Viability of the superfine sector
- Reducing costs of production, particularly wool harvesting costs
- Animal welfare
- Developing tools/information for growers looking to go non-mulesed
- Working with retailers to implement a rebate scheme for non-mulesed wool
- Advantages of the Wool Exchange Portal
- Fibre advocacy and research into therapeutic uses of wool
- Responsible Wool Standards
- Adequate wool classer training
- Climate change
- Concerns with increased use of chemicals for flystrike protection
- Smart ear tags
- Quick on-farm worm culture tests
- Support for AWI's Lifetime Ewe Management program
- 
- Support for IWTO's Sustainable Working Group
- Retailer training
- Availability of LTEM nationwide



# AWGA PRIORITIES FOR AWI



*ROLE OF ORGANISATION: AWGA was formed to represent wool growers and be a strong and independent voice. AWGA has been set up on a national platform to give wool growers and industry members direct and easy representation to AWI, governments, media and through the wool industry pipeline.*



## **Previous Priorities for both AWI and the wool industry:**

- Improving consultation
- Industry decline – sheep numbers and wool producers
- Effective monitoring and evaluation of projects
- Requested AWI Board mandate pain relief
- Uptake of breeding and breech modification alternatives for flystrike prevention
- Need to encourage more young growers into the industry
- Encouraging members to use pain relief if mulesing
- Need for an independent Chair of the ICC
- Ear tag technology
- Re-instatement of the Wool Carbon Alliance
- Animal welfare and animal rights campaigns
- R&D in innovative shearing technology
- Vertebrate pest control and terminal breeding programs

# BROAD WOOL PRIORITIES FOR AWI



*ROLE OF ORGANISATION: The Australian Corriedale Association represents broad wool breeds and consults with groups such as the Australian Stud Sheep Breeders Association.*



## **Previous Priorities for both AWI and the wool industry:**

- Flame-resistant rating of fibres taken into consideration on fire ratings for buildings
- Marketing of the benefits of wool in industrial sector
- Adequate wool classer training
- Vertebrate pest control
- Preparing better lines to attract a premium
- Wool Exchange Portal selling opportunities
- Need to encourage more young growers into the industry

# PGA PRIORITIES FOR AWI



*ROLE OF ORGANISATION: PGA aims to ensure the prosperity and long term viability of members, the agricultural and associated industries, by providing an effective voice statewide and federally through a financially sound, efficient, free enterprise organisation with strong leadership.*



## **Previous Priorities for both AWI and the wool industry:**

- Showing the value of AWI's marketing activities
- Clarifying the levy investment process
- Flystrike
- Ovine brucellosis
- Wild dogs
- Don't support more investment in marketing over R&D
- Reducing costs of production
- Expand AWI's Lifetime Ewe Management program
- Investment in more on-farm technology
- Concern over dominance of China
- Showing the benefits of Wool Exchange Portal
- Flystrike and genomics around welfare traits



# WPA PRIORITIES FOR AWI



*ROLE OF ORGANISATION: WPA plays a key role in working with organisations that are financed by grower funds - whether they are compulsory levies or fees for service - to develop constructive and profitable outcomes for industry.*



## **Previous Priorities for both AWI and the wool industry:**

- Maintaining NLIS and maintain mob-based system
- Drugs and alcohol in the shearing and wool handling industry
- IWTO Specifications
- Increasing use of NWD
- Encouraging the next generation of growers and leadership in the industry
- Responsible Wool Standards
- Foot rot
- Sheep Health Program
- Revision of Sheep Health Statement (to become Declaration)
- Foot and mouth - real time training in Nepal
- Sheep biosecurity strategy
- Welfare with NFF taskforce
- Wool RD&E strategy
- Genetics and genomics research
- Support for Australian marketing campaigns
- Shearing delivery systems and robotic shearing
- Effective communication with growers
- Shed safety training for growers
- Carcass evaluation project

Project	Number	Start date	End date	Research organisation
Achieving low cost (cervical) AI with frozen ram semen	ON-00252	12/02/14	31/12/18	University of Sydney
Researcher name	Total cost to AWI	Co-investor	Co-investment amount	Milestones delivered
Dr Simon de Graaf	\$970,985	None	\$50,000 NSW Stud Merino Breeders Association	9 of 11 Last milestone: December 2017

*Detail*

Project objective – understand and identify strategies to overcome the 20% fertility of frozen/thawed semen via cervical AI through study of the interaction between sperm, seminal fluid and the female reproductive tract using proteomics (mass spectrometry), and real time in vivo imaging, sperm physiology and field fertility trials.

1. Difference between proteins in epididymal sperm, fresh ejaculate, frozen/thawed sperm
  - Achieved characterised the ram proteome (727 unique protein identifications)
  - Achieved identification of 22 protein differences between fresh and thawed sperm cell membranes and crossed check with libraries to identify their function
2. Identify protein in in seminal plasma, cervical mucous (induced and natural oestrus)
  - Achieved identification of 362 proteins in seminal plasma
  - Achieved confirmation of no ionic concentration differences in seminal plasma
  - Achieved identification of 415 proteins in cervical mucous including specifying which changed over the oestrus cycle
  - Achieved quantification of the ionic concentration (Ca, Na, Mg, K, Cl) in cervical mucous over the oestrus cycle
3. Understand protein and functional interactions – effect of seminal plasma on sperm physiology, on survival of thawed sperm, on cervical mucous and on female tract. Understand variations in seminal plasma composition and its effects. (identify candidate potentiating proteins)
  - Achieved confirmation that rams differ in the post freezing sperm resilience and seminal plasma from this variation in rams differs in its effect on sperm motility (ie seminal plasma from high resilience to freezing rams can increase the motility of sperm from low resilience to freezing rams)
  - Achieved identification of 5 seminal plasma proteins associated with potentiation of seminal plasma and associated understanding of their biological function
  - Achieved demonstration that seminal plasma enhances the transit of sperm through the cervix by enhancing penetration of the cervical mucous and increased post thaw motility (but had no effect on fertilisation)
  - Achieved identification of 52 sperm proteins associated with interaction with the cervico vaginal fluid
4. Identify cervical mucous proteins that interact with sperm surface
5. Determine protein differences between cervical transiting sperm and non transiting sperm
  - Achieved identification of three membrane binding proteins found in ejaculate as candidates for interaction with cervical mucous
6. Test potentiating proteins in in vitro assays and in vivo imaging
  - Achieved supplementation of epididymal sperm with Binder of Sperm proteins prior to freezing improved sperm function after thawing (motility and velocity and cervical mucous interaction).
  - Achieved demonstration of sperm motility characteristics favourable to cervical mucous penetration and egg penetration (thrashing head)
  - Overall, pre freeze supplementation with Binder of Sperm Proteins (BSP) has had a significant positive effects on post thaw viability of ram sperm. Improvements in post thaw motility occurred in both in a standard culture medium and in an ‘vaginal mucus’, which suggests additional possible benefits for performance in the female reproductive tract. These observed improvements in post thaw sperm characteristics may be beneficial for in vivo fertility, however artificial insemination trials are required to investigate this.
7. Field trial – not started

**AWI – Artificial Insemination Projects – update for AASMB 25/01/2018**

Project	Number	Start date	End date	Research organisation	
Improving the success of sheep AI programs	On-00488	15/12/17	1/07/19	SARDI	
Researcher name	Total Project Budget	Total cost to AWI	Co-investor	Co-investment value	Milestones delivered
Dr David Kleeman	\$442,800	\$176,000	In-Kind SARDI	\$266,800	Milestone 1 and 2 delivered.

*Detail*

Project Objective - identify factors that affect synchrony of oestrus and develop new ewe treatment protocols and management strategies to improve AI success rates.

Contract execution in process.

1. Develop and evaluate improved treatment protocol(s) for synchrony of oestrus based on control of follicle wave emergence, progesterone concentrations and progesterone clearance rates. A new synchronization protocol is expected.
  - Step 1** – determine the relationship between the stage of the follicle wave at CIDR removal and the timing of oestrus in a pen trial of 60 ewes measured by ultrasonography (follicle development), onset of oestrus (CIDR removal, eCG and teasers). The preferred stage of the follicle wave for synchrony of oestrus will be determined.
  - Step 2** – manipulate the timing of the follicle wave through various treatments (prolonged progesterone exposure (12 versus 24 days); high concentration of progesterone (one or two CIDRs); GnRH. GnRH agonist; prostaglandin; eCG; LH; FSH and estradiol at various stages of the cycle) measured by ultrasonography. Efficacy of each treatment will be determined by monitoring synchrony of oestrus.
2. Examine the effects of and interactions between body condition score, feed intake and progesterone concentrations on synchrony of oestrus (measured by teasers and ultrasonography). Develop improved management strategies for AI programs from results of a field trial.
3. Conduct a national survey on success rates of AI programs, determine the economic value of the AI industry and to identify technical issues on a regional and state basis. Data obtained will help develop new strategies to improve AI outcomes.

- The survey has commenced under the auspices of the SASMBA. The survey will focus on but not be restricted to the results of the 2016/2017 breeding season. Each participating producer will be asked if he/she is prepared to provide their flock for further observation in subsequent years – the intention is to identify a small number of flocks with either “good” or “bad” results that will facilitate “on farm” comparisons of factors that influence success rates.

- AWI has asked that veterinarians be surveyed.

4. Extend the technical advances made to the whole of industry to include wool sheep, dual purpose sheep and British breeds including through an extension package for veterinarians and sheep breeders.

# WOOL IS GOOD FOR THE SKIN

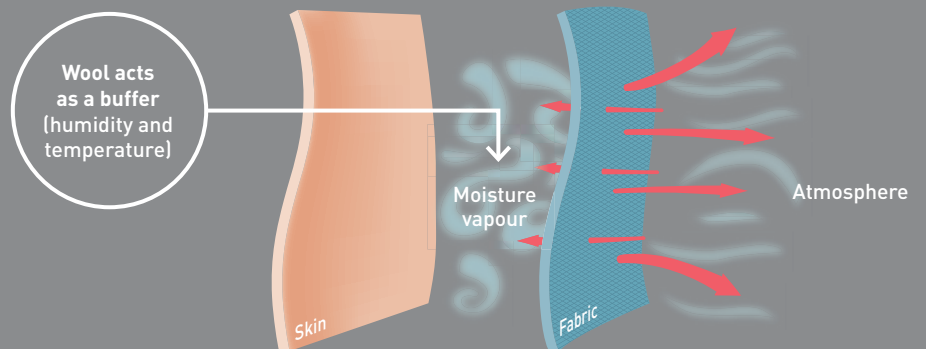
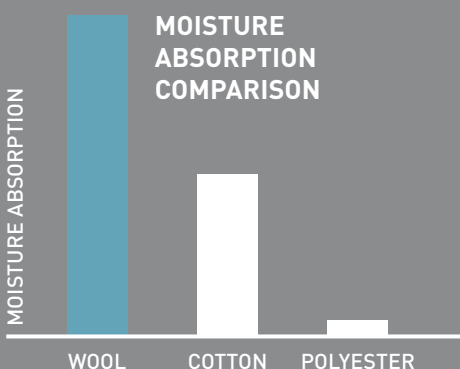


Recently published research has demonstrated that wearing superfine Merino wool next to the skin is therapeutic for eczema sufferers. This adds to a growing number of research findings supporting the health and wellbeing benefits of superfine Merino wool. The research has shown that Merino wool assists those suffering from this chronic skin condition, challenging misconceptions that all wool is prickly and itchy.

## WHAT IS ECZEMA?

Eczema, or Atopic Dermatitis, is an allergic condition where the skin becomes dry, leading to cracking, bacterial infection, redness and itching. It affects around 30% of children and its prevalence varies geographically. The most common treatments currently include the regular application of moisturisers and topical steroids to reduce inflammation, as well as antibiotics to address infection.

## WOOL IS THERAPEUTIC FOR ECZEMA SUFFERERS



Whether it's hot, cold, humid or dry, Merino wool garments are the most breathable of the common apparel types. Wool can absorb and release twice as much moisture vapour as cotton and thirty times as much as polyester.

When worn next to the skin, wool works as a dynamic buffer in the micro-climate between the fabric and the skin, smoothing out the humidity and temperature. It appears wool acts like a second skin for these people whose 'first' skin is too dry.

Eczema sufferers have especially sensitive skin and an Australian study at the Murdoch Childrens Research Institute has shown that wool garments made from soft and breathable superfine Merino wool were well tolerated by participants and reduced their eczema symptoms (NB: the garments must have a mean fibre diameter less than or equal to 17.5 micron).

## WOOL IS GOOD FOR THE SKIN

# DERMATOLOGY TRIALS SHOW REDUCTION IN ECZEMA SYMPTOMS

In positive news for eczema sufferers, two recent dermatology trials have shown that infant and adult eczema sufferers have reduced symptoms when wearing superfine Merino wool garments next to the skin. A further study is currently under way in the USA (led by Professor Joe Fowler of the University of Louisville, Kentucky).

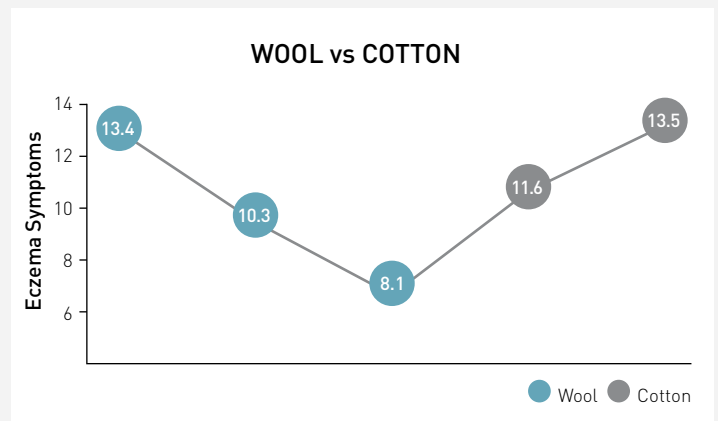
### STUDY 1: “WOOL CLOTHING RECOMMENDED FOR INFANTS WITH ECZEMA” (MCRI, MELBOURNE)

The theory that wool’s unique moisture management could benefit eczema sufferers was put to the test in a recent clinical trial, which confirmed the beneficial findings of wearing superfine Merino wool with a mean fibre diameter less than or equal to 17.5 micron.

The study, led by Associate Professor John Su, showed that superfine Merino wool clothing reduced the severity of paediatric mild-moderate Atopic Dermatitis as compared to cotton clothing.

The graph to the right shows the reduction in eczema symptoms when wearing wool and the increase in symptoms when resuming cotton clothing.

Published in the *British Journal of Dermatology*, this study challenges generalisations that wool is to be avoided by children with eczema. The study concluded that



traditional management guidelines should be modified to include superfine Merino wool as a recommended clothing choice in childhood Atopic Dermatitis.

### STUDY 2: “SUBSTANTIAL REDUCTIONS IN SYMPTOMS FOR ADOLESCENTS AND ADULTS WITH ECZEMA” (QIDERM, BRISBANE) – PILOT

A study of adolescent and adult sufferers of eczema in Brisbane by the Queensland Institute of Dermatology (QIDerm) has also demonstrated the beneficial effects of wearing superfine Merino wool next to the skin.

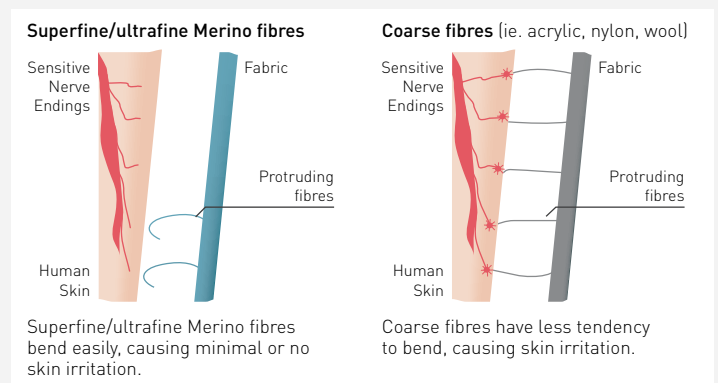
The study, led by Dr Lynda Spelman of QIDerm, confirmed that not only did participants tolerate superfine merino wool fabric, there was a therapeutic advantage in wearing these garments during the intervention phase. Mental and physical wellbeing were improved

by wearing superfine Merino wool fabrics for children and young adults.

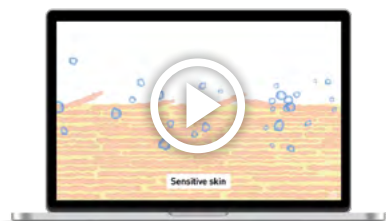
Dr Lynda Spelman said all the trial participants showed substantially reduced symptoms with none of them displaying an allergic or irritant reaction. “We have seen substantial reductions in skin dryness, redness and itchiness and in the measured area of inflammation – and for a number of the patients, this is the first time a real solution to their condition has been presented,” Dr Spelman said.

## WOOL IS NOT AN ALLERGEN

A highly esteemed group of medical professionals from across the world has reviewed research papers published during the past 100 years to critically assess scientific studies claiming wool causes allergy. The group has now published a paper “Debunking the Myth of Wool Allergy” with the primary conclusion that there is no credible evidence wool is an allergen. It found that if a fabric does cause sensations of itch and prickle on the skin then it is because of the large diameter of the fibres and not due to the fibre type being wool.



## WOOL IS GOOD FOR THE SKIN



Watch now to discover the therapeutic benefits of superfine Merino wool.

[youtube.com/thewoolmarkcompany](https://www.youtube.com/thewoolmarkcompany)

## REFERENCES

Eczema affects around 30% of children and its prevalence varies geographically “Determining Effects of Superfine Sheep wool in INfantile Eczema (DESSINE): a randomized paediatric cross over study”, J.C. Su et al. *British Journal of Dermatology*, 2017, p 2.

Wool can absorb and release twice as much moisture vapour as cotton and thirty times as much as polyester: A. Rae and R. Bruce. *The Wira Textile Data book*, Leeds. The Wool Industries Research Association, 1973, pp 64 – 72.

The group has now published a paper “Debunking the Myth of Wool Allergy” with the primary conclusion that there is no credible evidence wool is an allergen: Michaela Zallmann et al. *Debunking the Myth of Wool Allergy: Reviewing the Evidence for Immune and Non-immune Cutaneous Reactions*, *Acta Dermato Verereologica*, 2017.

Superfine Merino wool clothing reduced the severity of paediatric mild-moderate Atopic Dermatitis as compared to cotton clothing: J.C. Su et al. *Determining Effects of Superfine Sheep wool in Infantile Eczema (DESSINE): a randomized paediatric cross over study*, *British Journal of Dermatology*, 2017, p 12.

The study concluded that traditional management guidelines should be modified to include superfine merino wool as a recommended clothing choice in childhood Atopic Dermatitis: J.C. Su et al. *Determining Effects of Superfine Sheep wool in Infantile Eczema (DESSINE): a randomized paediatric cross over study*, *British Journal of Dermatology*, 2017, p 12.

Not only did participants tolerate superfine merino wool fabric, there was a therapeutic advantage in wearing these garments during the intervention phase. Mental and physical wellbeing were improved by wearing superfine Merino wool fabrics for children and young adults: L. Spelman et al. Queensland Institute of Dermatology/Australian Wool Innovation, *An assessment of superfine merino wool as therapeutic in the treatment of Atopic Dermatitis for children and young adults*, 2016 (unpublished), p 14.



## **Medical Specification for Sensitive Skin – Primary specifications for wool base layer fabrics**

Henry Wang<sup>1</sup>, David Crowe<sup>1</sup>, Trevor Mahar<sup>2</sup>, Paul Swan<sup>2</sup>, Angus Ireland<sup>2</sup>

(1. Australian Wool Testing Authority Ltd, Melbourne, Victoria, Australia, 3031;  
2. Australian Wool Innovation Ltd and The Woolmark Company, Sydney, New South Wales, Australia 2001)

With the development of the Wool ComfortMeter, an opportunity exists to develop a medical specification for wool knitwear, and to ensure skin comfort for the therapeutic benefit of atopic dermatitis sufferers.

Garments and data from an existing Sheep CRC wearer trial were used in this paper. The relationship between comfort and skin irritancy were examined. Furthermore, principal component analysis was used to identify the skin irritancy ('prickle') rating pattern of the wearers across different environmental conditions, in order to precisely determine the level at which garments generated 'prickle' sensations. Based on the results, a set of medical specifications for sensitive skin was established for wool base layer fabrics. That is, the Wool ComfortMeter index should not be higher than 200; the mean fibre diameter should not be greater than 17.5 µm; the percentage of the fibres coarser than 25 µm should not be higher than 2.0%.

**Keywords:** Wool; Sensitive Skin; Base Layer Fabrics; Comfort; Wool ComfortMeter; Medical Specification

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**Project:** Development of a Medical Specification for Non-irritant Wool (OF-00230), AWI funded project

**First Author:** Henry Wang, PhD.

**Email:** henry.wang @awta.com.au

## INTRODUCTION

Reflecting the wide technical diversity of wool within and across breeds of sheep, wool is suited to a diverse range of end-product markets, from the lightweight knits and wovens, through to carpets and furnishings. However, this technical diversity confers a fitness-for-purpose challenge for wool in sensitive end-uses such as lightweight next-to-skin apparel for medical use, and indeed the great majority of wool produced around the world is not suited to this application. This fitness-for-purpose challenge is most clearly seen in the wide consumer perception is that wool is 'prickly' or the cause of allergic responses. However, a recent medical review and research showed that the term allergy was often misused on wool when skin cutaneous reactions was caused by some stiff protruding fibre ends on the fabric surface (Zallmann et al, 2017). The research further showed that wearing superfine and ultrafine Merino wool next to the skin did not cause prickle but was rather therapeutic for eczema sufferers (Zallmann et al, 2017, Su et al 2017). Accordingly, a supply chain generating reliably non-irritant wool base layer fabrics requires a series of product specifications to ensure wearer comfort next to sensitive skin.

Researchers identified the initial basis for such specifications in the 1980's, finding that a range of fibre and fabric properties which contributed to the likelihood of mechanical irritation (or 'prickle') of skin. Prickle is caused by fibre ends protruding from the fabric surface, which are stiff enough to exert a load of approximately 75mgf or more against the skin (Garnsworthy et al, 1988). Therefore prickle can be caused by any fibre types which meet this criterion, including synthetic, oil-based fibre types. In summary, research in Australia into fabric-evoked prickle has evolved over the following three stages:

1. Establishment of the neurological basis for prickle in the mid 1980's, i.e. prickle is related to fibre diameter and is not an allergic reaction to the presence of wool. In particular, Garnsworthy et al (1988) showed that fabric-evoked prickle is the result of low-grade activity in nociceptors and that the stimuli are protruding fibre ends exerting a load equal or greater than 75mgf against the skin.
2. The development of reliable measurement of coarse fibre content of wool and the investigation of the effect on prickle of fabric structural variables in the 1990's. Within the mean fibre diameter range examined (i.e. 16.9  $\mu\text{m}$  – 24.4  $\mu\text{m}$ ), Naylor et al (1997) showed that the percentage of fibre ends greater than 32  $\mu\text{m}$  is critical to perceptions of prickle for single jersey fabrics. Thus, the measurement of Comfort Factor (i.e. the percentage of diameter less than or equal to 30  $\mu\text{m}$ ) was introduced to the wool diameter distribution measurement standards (IWTO-12-2012, IWTO-47-2013).
3. The development of objectively testing propensity for fabrics to induce wearer sensations of prickle. The Australian CRC for Sheep Industry Innovation (Sheep CRC) oversaw development of the Wool ComfortMeter (WCM) based on large scale of wearer trials (Ramsay, 2010, Ramsay et al, 2012, Tester, 2010). The recent commercialisation of the Wool ComfortMeter has provided the textile supply chain with an opportunity to measure the intensity of prickly fibre ends on a fabric surface (IWTO, 2017).

These achievements have provided a sound base to assist the supply chain to meet the comfort requirements of its customers. In this paper, the garments and the results from a previous Sheep CRC wearer trial were used to establish a series of medical specifications of wool base layer fabrics for sensitive skin.



## **EXPERIMENTAL DESIGN AND METHODS**

### **Materials**

There were 48 knitted long sleeve garments assessed in the Sheep CRC project (McGregor et al, 2013), of which there were 42 pure wool or wool rich garments, two pure cotton garments, one pure cashmere garment, one wool and cashmere blend garment, and two polyester and elastane blend garment. The majority of the garments were single jersey, but two were pique and there was one rib and one interlock. The range of mean fibre diameter (MFD) of wool used was from 14.0  $\mu\text{m}$  to 21.2  $\mu\text{m}$ . After a standard wash, the range of the fabric thickness was 0.5 mm – 1.6 mm, and the range of fabric weight was 155g/m<sup>2</sup> to 320 g/m<sup>2</sup>.

### **Wearer trials**

There were 12 wearer trials carried out over the duration of the project. The participants were all women aged from 25 to 35 years old. Multiple wearers (i.e. at least 24) and garments were employed in each trial. In addition, there were six garments used as link garments between the trials for calibrating the ratings.

After a period of 30 minutes acclimatization, the following four environmental ‘conditions’ were consecutively introduced in the trial: “cool” at temperature 23°C  $\pm$  0.5°C and relative humidity 45%  $\pm$  5% for 15 minutes (P-C); “hot” at temperature 40°C  $\pm$  0.1°C and relative humidity 24%  $\pm$  0.5% for 15 minutes (P-H); “hot with walking” at temperature 40°C  $\pm$  0.1°C and relative humidity 24%  $\pm$  0.5% for 15 minutes (P-HW); and, “cool after hot” at temperature 23°C  $\pm$  0.5°C and relative humidity 45%  $\pm$  5% for 15 minutes (P-CaH) . Under each environmental condition, a series of physical activities was performed by the wearers for 3 or 4 (~5 minute) periods, resulting in 15 periods in each trial. At the end of each period, there were 11 subjective comfort related ratings provided by the wearers on a 1 to 9 scale, including prickle, itchiness, scratchiness, dampness, mugginess, clinginess, coldness, sweatiness, absorbency, heaviness and overall discomfort. A detailed description of the trial is provided by Stanton (Stanton et al, 2014).

### **Garment Testing**

Fibre diameter test: Mean fibre diameter and fibre diameter distribution of the garments were measured on a Laserscan at AWTA Ltd according to the IWTO-12:2012 standard. Mean fibre diameter (MFD), coefficient of variation of the diameter (CVD), curvature, comfort factor (CF), spin fineness and the percentage of the fibre diameter coarser than 25 micron ( $\% \geq 25 \text{ micron}$ ) were obtained.

Comfort index test: All garments were tested on a Wool ComfortMeter according to the IWTO-DTM-66:2016 standard at the AWTA Ltd. A comfort index (CI) was obtained for each garment.

### **Method - Multivariate data analysis**

It would be expected that a similar prickle response pattern would be obtained from each member of the wearer panel for the same fabric, even though the wearers may have different levels of sensitivity (Figure 1). Therefore, individual ratings over the 15 periods will be regarded as a prickle response ‘curve’. Because the 15 ratings were highly correlated, a principal component analysis (PCA) was applied to examine the similarity of the response among the wearers and identify the outliers who had a significantly different response pattern from the

majority of wearers. Furthermore, based on the principal component scores, the garments were classified into “non-prickle”, “prickle in hot”, and “prickle” under all conditions.

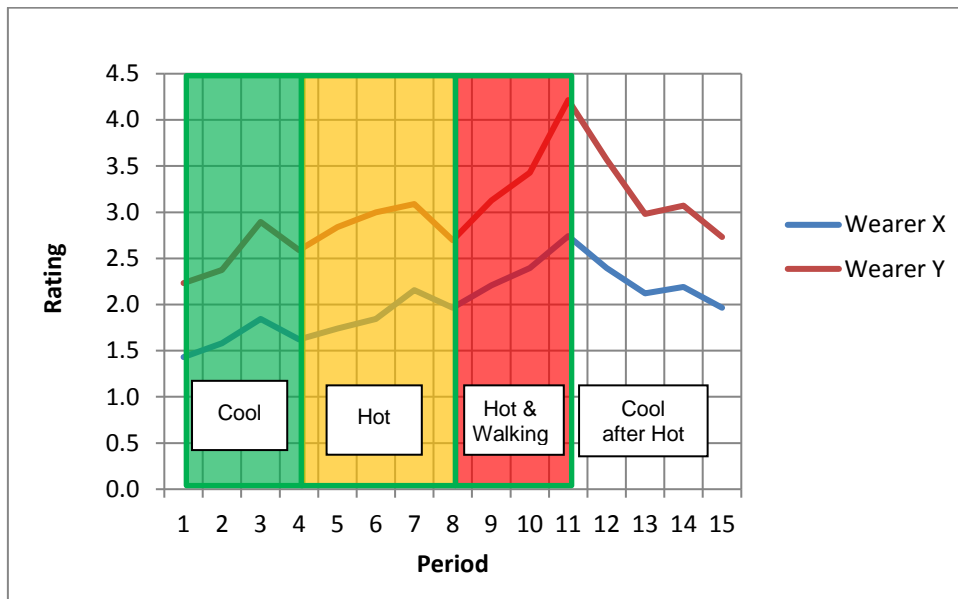


Figure 1. Two Typical Prickle Response ‘Curves’

## RESULTS AND DISCUSSION

### Dominant Factors Affecting Skin Comfort

Correlation analysis among the 11 subjective attributes showed that the other ten sensory attributes were correlated with the overall discomfort at different levels. Figure 2 shows the correlation coefficients. It can be seen that the three direct irritant attributes, i.e. itchy, prickly and scratchy attributes, were highly correlated with the overall discomfort for the range of wool garments examined.

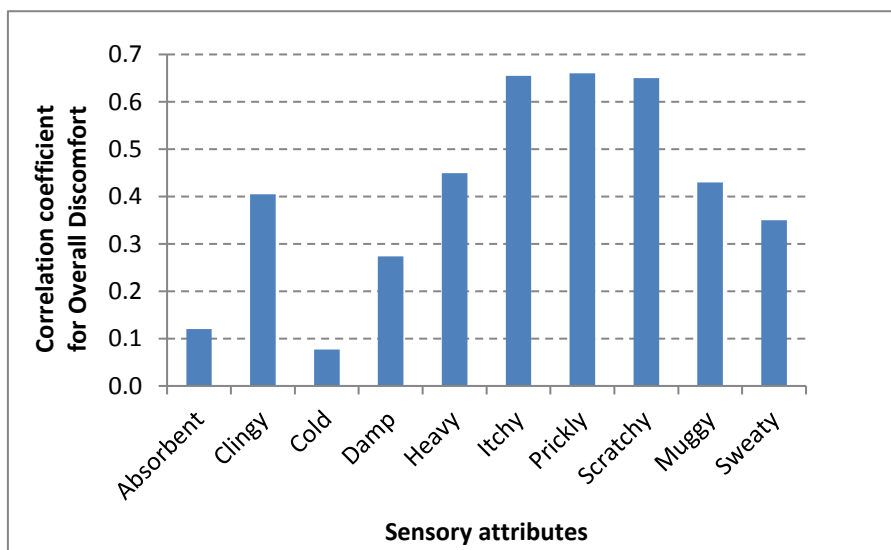


Figure 2. Correlation relationship between overall discomfort and other sensory attributes

Figure 3 shows the relationships between the rankings of the garments by the overall discomfort and by the three irritant attributes. Compared to the other non-irritant attributes, the rankings by the three irritant attributes had a higher agreement with the rankings by the overall discomfort. It strongly indicated that irritant attributes largely determined the degree of the skin comfort of wool base layer fabrics.

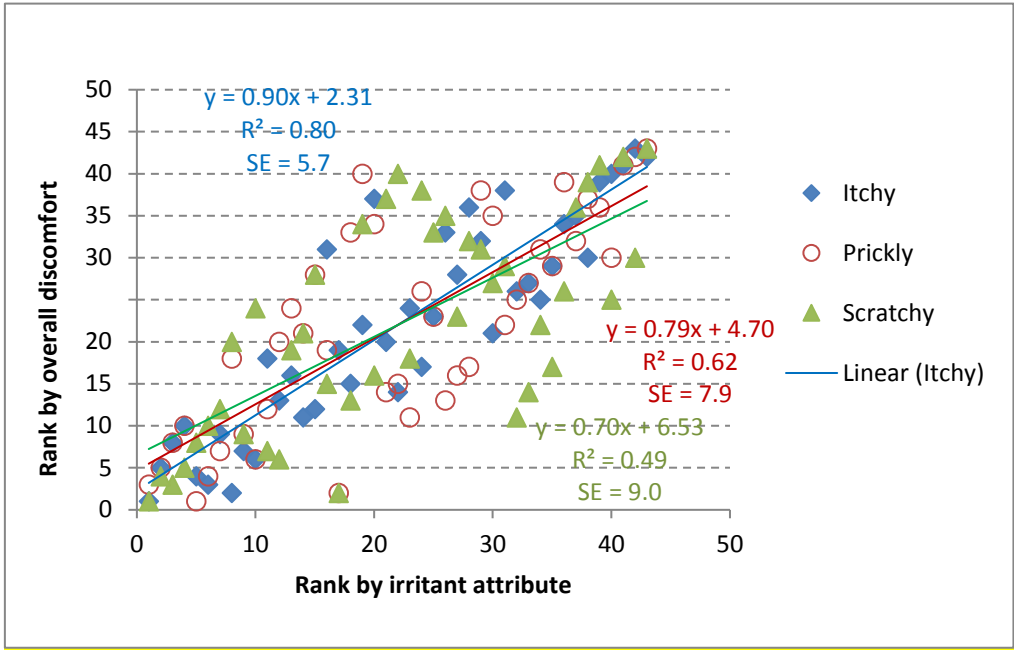


Figure 3. Relationships between the rankings of the garments by the overall discomfort and by the three irritant attributes

**Identification of Non-Irritant Garments**

PCA was applied to the average rating of each environmental condition to identify the overall prickle level of the 48 garments across the conditions. Approximately 99% of the total rating variation was explained by the four principal components (PC), of which PC1 explained approximately 88% across all the conditions. PC2 explained approximately 7% of the total variation and seemed to separate the “cool after hot condition” from the other conditions. PC3 explained 2% of the total variation and separated the “cool” and “hot” conditions that had the same activities. PC4 explained another 2% of the total variation and differentiated the “hot plus walking” condition from the other conditions.

PC1 represented the prickle intensity level of the garments across all the conditions. The higher a garment scored on PC1, the higher prickle intensity of the garment. As described previously, PC2 – PC4 separated the garments based on the environmental change. Figure 4 shows the separation of the garments by PC1 and PC3. As shown in the figure, the garments were clearly classified into Non-prickle (when  $PC1 \leq -1.0$ ), Prickle in Hot ( $-1.0 < PC1 \leq 0$  &  $PC3 \geq 0$ ) and Prickle ( $PC1 > 0$ ) in all the conditions.



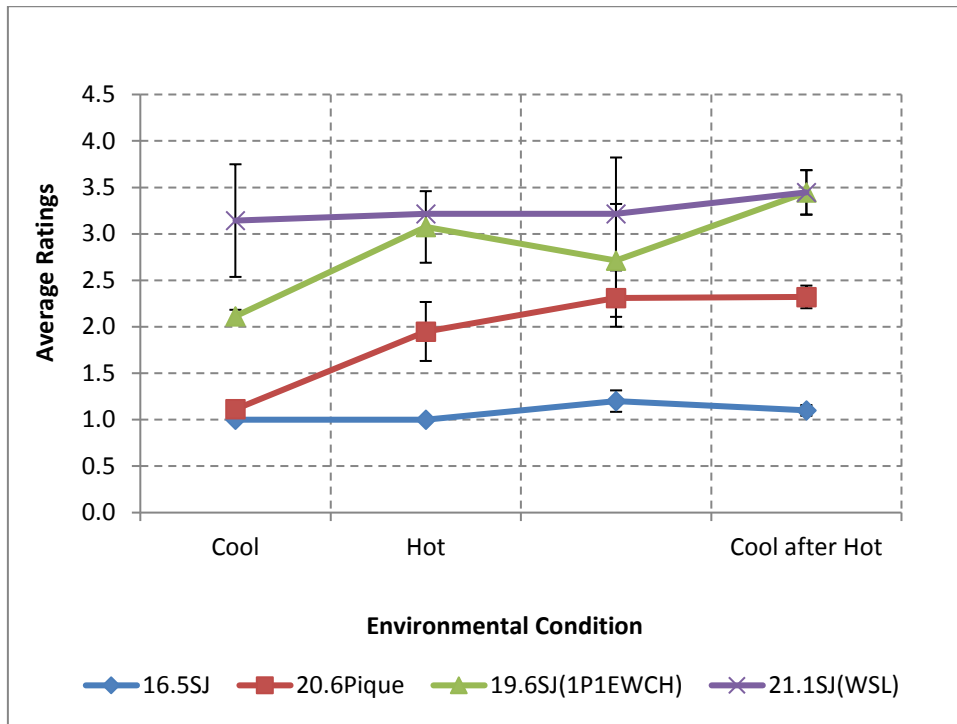


Figure 5. Prickle Response ‘Curves’ for an Extreme Garment in each Quadrant of Figure 2

The numbers of 48 garments in each class is listed in Table 1. Approximately 33% of the garments were classed as non-prickle in all environments. Approximately 10% of the garments were classified as prickly in 'Hot' conditions and the remaining, approximately 56%, of the garments were considered prickly in all conditions.

Table 1. The Number of Each Garment Class

Class	Number	Percentage (%)
Non Prickle	16	33.3
Prickle in Hot	5	10.4
Prickle	27	56.3
Total	48	100

### Specification of Diameter

As summarised in the introduction, the propensity of fabric-evoked prickle is largely dependent upon the areal density of stiff protruding fibre ends from the fabric surface. These stiff fibre ends are mechanically associated with having either a short protruding length or coarse fibre diameter or both (Naylor et al, 1997; McGregor et al, 2013). In practice, diameter of the coarse fibres is easier and more reliable to be quantified than the length of fibre ends. Therefore, a Comfort Factor value has been reported from the standard measurements of fibre diameter by the Laserscan and the OFDA100 (IWTO-12-2012, IWTO-47-2013).

In general, critical coarse fibre diameter was not strictly specified but suggested some levels based on the range of garments examined. The percentage of  $\geq 32$   $\mu\text{m}$  coarse fibres was suggested by Naylor et al, 1997 for a range of wool and acrylic worsted knitted single jersey fabrics, with a MFD ranged from 16.9  $\mu\text{m}$  to 24.4  $\mu\text{m}$ . Impotently, Naylor et al (1997) pointed out in the conclusion that “*For other fabrics with different surface characteristic, the critical*

*diameter may vary*”. In this paper, superfine and ultrafine wool were widely used for the CRC garments, with which the MFD ranged from 14.0 to 21.2 micron. For a normal distribution of superfine and ultrafine wool diameter, the critical coarse diameter 32  $\mu\text{m}$  is statistically beyond the cover range. Therefore, the percentage of  $\geq 25$   $\mu\text{m}$  coarse fibres was believed to be a reasonable selection to replace the critical value of 32  $\mu\text{m}$  reported.

Figure 6 shows an exponential relationship between MFD and the percentage of fibres  $\geq 25$  micron. It indicates that consideration of the percentage of coarse fibres  $\geq 25$  micron required to achieve non-prickle garments. Noticeably, there were three non-prickle garments which had a higher percentage of  $\geq 25$  micron than the others. The first one (G002) was made from 18.5 micron wool in single jersey and contained 3.1%  $\geq 25$  micron wool. The second one (G050) was made from 96% 18.2  $\mu\text{m}$  wool & 4% elastane (25tex 1 ply 1 end) in single jersey and contained approximately 4%  $\geq 25$  micron wool. The third one (G052) was made from 100% 18.1  $\mu\text{m}$  wool in single jersey and contained approximately 4%  $\geq 25$  micron wool. Garment G052 was mercerised during finishing. It is interesting that spinning with elastane or mercerisation during finishing seemed to reduce the prickle propensity of the fabrics which had a relatively high percentage of fibres  $\geq 25$  micron.

There was a clear separation shown in Figure 6 between the non-prickle and prickle garments by the MFD and the  $\% \geq 25$  micron, although there were some overlaps between the classes. It is also worth noting that no garment in the trial, including fabrics made from either cotton or ultrafine Merino, was rated by all wearers in all conditions as “non-prickle”.

The variability of human perception will always be challenging for a medical specification for next to sensitive skin wear (Wang et al, 2003). Data gaps in key MFD and  $\% \geq 25$  micron ranges shown in Figure 6 further complicate identification of initial threshold values. With this in mind, for the purposes of a medical specification, it was decided to use  $\leq 17.5$   $\mu\text{m}$  as the MFD threshold and  $\leq 2.0\%$  as the  $\geq 25$  micron threshold in the primary specifications. As shown in Figure 6, both threshold levels had a similar distance to both the non-prickle and prickle garments on the separation boundaries, which meet the conditions for a linear classifier.

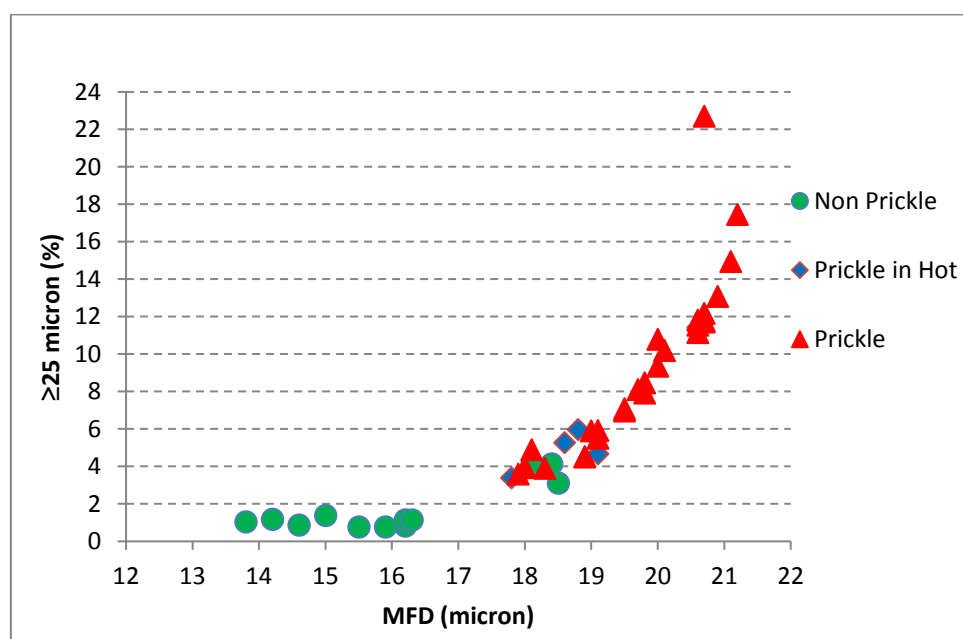


Figure 6. MFD versus  $\% > 25$  micron for the Classified Garments

Examination of other fibre parameters such as CVD, curvature and Spin Fineness showed that there were no significant relationships between these parameters and subjective prickle response in this analysis.

### Specification of Wool ComfortMeter Index

Table 2 lists the correlation coefficients between the WCM index and the sensory fabric attributes. As expected, the WCM index was strongly correlated to the prickle, itchiness and scratchiness. Interestingly, the WCM index was also correlated to the heat and moisture transfer related sensory attributes such as clinginess, mugginess, absorbency and coldness in some conditions. As a result, the WCM index was highly correlated with the overall discomfort.

Table 2. Correlation coefficients between the WCM index and sensory attributes

	Cool	Hot	Hot with walking	Cool after hot	Mean Rating
Absorbent	0.00	0.10	0.57	0.45	0.55
Clingy	0.58	0.63	0.61	0.57	0.64
Cold	0.32	0.00	0.00	0.57	0.38
Damp	0.00	0.32	0.34	0.36	0.40
Heavy	0.09	0.29	0.25	0.19	0.25
Itchy	0.78	0.73	0.73	0.84	0.82
Muggy	-0.03	0.11	0.43	0.60	0.45
Prickly	0.74	0.84	0.61	0.80	0.79
Scratchy	0.79	0.66	0.69	0.78	0.78
Sweaty	0.00	0.33	0.29	0.42	0.43
Overall Discomfort	0.71	0.79	0.64	0.74	0.77

Figure 7 shows the relationship between MFD and the WCM values for the three classes of fabrics. It can be seen that the WCM value less than and equal to ( $\leq$ ) 200 units would separate the fabrics rated as prickly from the non-prickle class. The WCM measurement identified one Prickle in Hot and four prickly garments which were made from wool less than 18.5 micron.

Note that non prickle Garments G002 (228 units), G050 (362 units) and G052 (354 units), respectively, were over the 200 WCM unit limit. The overlap of these three 'non-prickle', five 'prickle in hot' and 'prickle' garments implied that the current WCM test may not be able to differentiate the differences in prickle under the cool and hot conditions. This result indicates that there may be other factors, perhaps related to thermal properties of fabrics, which may contribute to prickle rating. Alternatively, it may be the result of the fickleness of the ratings given by the trial subjects.

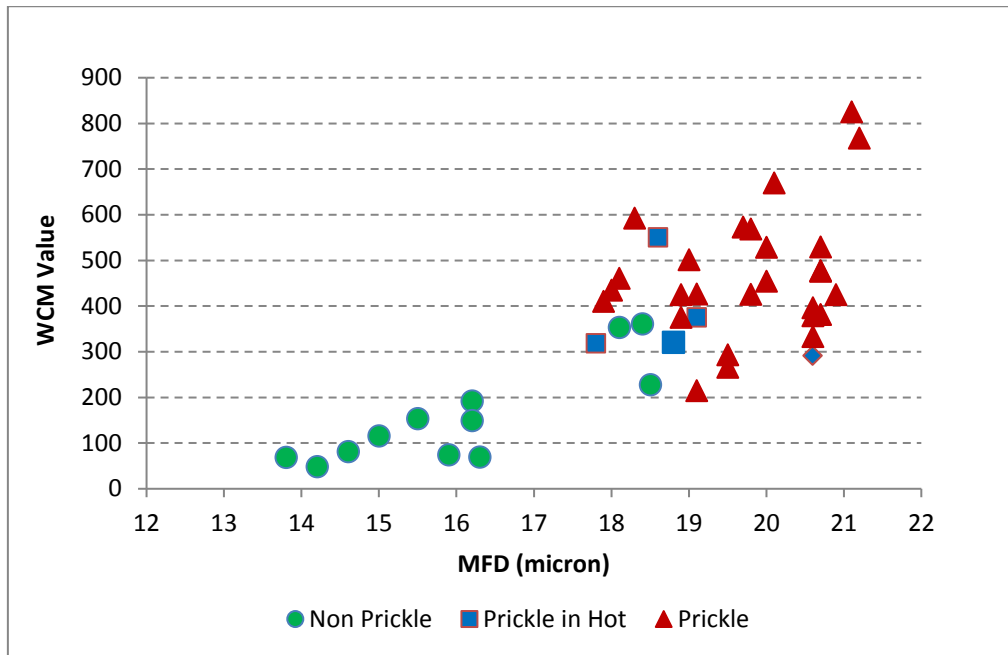


Figure 7. MFD versus WCM Values for the Classified Garments

### Validation of the Medical Specifications

Table 3 shows the validation results after the primary specifications were applied individually (in last 2 columns) or jointly (in last 2 rows) to the 44 wool or cashmere fabrics used in the CRC study. Both the 0% percentages of the false positive results for the non-prickle class strongly indicated that the medical specifications established were robust for selection of non-prickle fabrics. However, the false negative results for the classification in Table 3 imply that the specification may need to be extended. A set of secondary medical specifications may be required to address some special cases.

Table 3 Validation Results of Applied the Primary Specifications to the CRC Garments.

Criterion	Non Prickle	Prickle (incl. Prickle in Hot)	False Positive	False Negative
Fabric number classed	12	32		
MFD $\leq 17.5$ $\mu\text{m}$	12 (100%)	0 (0%)	0 (0%)	0 (0%)
$\% \geq 25\mu\text{m} \leq 2.0 \%$	9 (75%)		0 (0%)	3 (6.8%)
WCM value $\leq 200$	9 (75%)	0 (0%)	0 (0%)	3 (6.8%)
False Positive (combined all criteria)	0 (0%)	0 (0%)		
False Negative (combined all criteria)	3 (6.8%)	0 (0%)		

### CONCLUSIONS

Multivariate data analysis of the Sheep CRC wearer trial data successfully classified the 44 wool base layer garments into non-prickle, prickle in hot condition and prickle under all the conditions. Prickle was a dominant factor affecting the overall skin comfort of the garments worn next to skin. The newly developed Wool ComfortMeter could measure the skin comfort of



a garment. In conjunction with current standard fibre diameter measurements, the Wool ComfortMeter index was identified as a key component of a medical specification for sensitive skin:

Specification	Parameter	Threshold Value
	WCM Reading (unit)	$\leq 200$
Diameter	MFD (micron)	$\leq 17.5$
	$\geq 25$ micron fibres (%)	$\leq 2.0$

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## REFERENCES

- Bruce A. McGregor, Maryam Naebe, John Stanton, Jane Speijers, John Beilby, Sara Pieruzzini & David Tester (2013): Relationship between wearer prickle response with fibre and garment properties and Wool ComfortMeter assessment, *Journal of The Textile Institute*, 104:6, 618-627
- Garnsworthy, R. K., Gully, R. P., Kenins, P., Mayfield, R. J. and Westerman, R. A. (1988), Identification of the Physical Stimulus and the Neural Basis of Fabric- Evoked Prickle, *J. Neurophysiol.* 59(4), 1083-1097.
- IWTO (2012). Measurement of the Mean and Distribution of Fibre Diameter Using the Sirolan-Laserscan Fibre Diameter Analyser., International Wool Textile Organisation. IWTO-12-2012.
- IWTO (2013). Measurement of the Mean and Distribution of Fibre Diameter of Wool Using an Optical Fibre Diameter Analyser (OFDA). IWTO-47-2013.
- IWTO (2017), Test Method for the Skin Comfort of Next to Skin Wool Fabrics, IWTO-66:2017
- Naylor, G.R.S and Philips, D.G. (1995), "Skin Comfort of Wool fabrics", Proceedings of the 9th International Wool Textile Research Conference, Biella, 2, 203-209.
- Naylor, G. R. S, Phillips, D. G., Veitch, C. J., Dolling, M., and Marland, D.J. (1997), Fabric-evoked Prickle in Worsted Spun Single Jersey Knitted Fabrics Part I: The Role of Fibre End Characteristics, *Textile Res. J.* 67(4), 288 – 295.
- Naylor, G. R. S. and Phillips, D. G. (1997), Fabric-evoked Prickle in Worsted Spun Single Jersey Knitted Fabrics Part II: the Role of Fibre Length, Yarn Count and Fabric Cover Factor, *Textile Res. J.* 67(5), 354 – 358.
- Ramsay, D. J. (2010). Apparatus and Method for Providing a Measurement of the Prickle Propensity of a Fabric, Yarn or Garment Surface Having Protruding Fibre Ends. . Australia. Patent PCT/AU2010/000009.
- Ramsay, D. J., D. B. Fox and G. R. S. Naylor (2012). "An Instrument for Assessing Fabric Prickle Propensity " *Textile Research Journal* 82: 513-520.

Stanton, J. H., Speijers, J., Naylor, G. R. S., Pieruzzini, S., Beilby, J., Barsden, E. and Clarke, A. (2014), Skin Comfort of Base Layer Knitted Garments. Part I: Description and Evaluation of Wearer Test Protocol, *Textile Res. J.* 84(13), 1385-1399

Su, J.C., Dailey, R., Zallmann, M., Leins, E., Taresch, L., Donath, S., Heah, S.S. and Lowe, A.J. (2017), Determining Effects of Superfine Sheep wool in INfantile Eczema (DESSINE): a randomized paediatric cross over study. *Br J Dermatol.* Accepted Author Manuscript. doi:10.1111/bjd.15376

Tester, D. H. (2010). "Relationship between Comfort Meter Values and the Prickle Rating of Garments in Wearer Trials " *Animal Production Science* 50: 1077-1081.

Wang, G., Zhang, W., Postle, R., and Phillips, D. (2003), "Evaluating Wool Shirt Comfort with wear trials and the forearm test", *Textile Research Journal*, 73(2), 113-119.

Zallmann, M., Smith, P. K., Tang, M. L. K., Spelman, L. J., Cahill, J. L., Wortmann, G., Katelaris, C. H., Allen, K. J. and Su, J. C. (2017), Debunking the Myth of Wool Allergy: Reviewing the Evidence for Immune and Non-immune Cutaneous Reactions, *Acta Derm Venereol* 2017; 97, 1-10, doi: 10.2340/00015555-2655

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**Determining Effects of Superfine Sheep wool in INfantile Eczema (DESSINE): a randomized paediatric cross over study**

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keywords: atopic dermatitis, clothing, textile, irritant, childhood

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staff Drs Paul Swan, Trevor Mahar, Angus Ireland and Ms Amy Wales.

What's already known about this topic?

- ❖ There are few published reports of the effects of wool on atopic dermatitis, and these papers date back to the 1950s when reporting did not meet current standards. Since then, improvements in specification of wool fibre diameter and in wool processing have enabled production of less irritant clothing, which is also less contaminated by allergens.
- ❖ There is up to now little available clinical evidence for adverse or beneficial effects of superfine wool.

What does this study add?

- ❖ This study challenges generalizations that wool is to be avoided by children with eczema.
- ❖ It is the first original clinical study examining the clinical effects of superfine merino wool on (childhood) atopic dermatitis and highlights the need for further studies on the effects of clothing and of the microenvironment between clothing and the skin on atopic dermatitis.

## **Abstract**

### Introduction

Despite limited evidence, woollen clothing has traditionally been considered to be an irritant that should be avoided by individuals with atopic dermatitis (AD). Wool fibres come in a range of diameters, and have beneficial thermodynamic and moisture transport properties. This study examines the effects of superfine merino wool on symptoms in participants with mild-moderate AD.

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## Methods

The trial was a 12-week randomized assessor-blinded cross-over prospective cohort study of 39 patients aged 4 weeks to 3 years with mild-moderate AD, comparing superfine merino wool ensembles with standard cotton clothing chosen by parents.

Participants were assigned to wool or cotton clothing and assessed 3 weekly for 6 weeks, before crossing over to wear the other clothing material for a further 6-week period, with similar 3 weekly reviews. The primary endpoint was the SCORing Atopic Dermatitis index (SCORAD) after each 6-week period, with Atopic Dermatitis Severity Index (ADSI), Infant's Dermatitis Quality Of Life index (IDQOL) and topical steroid use as secondary endpoints to measure AD severity and quality of life.

## Results

Overall, compared with baseline, superfine wool ensembles were associated with a reduction in mean SCORAD of 2.5 (95%CI=-4.7,-0.4) at 3 weeks and 7.6 (95%CI= -10.4,-4.8) at 6 weeks when compared to the cotton ensembles. A similar change was observed in ADSI and IDQOL scores for the same period. Body steroid use was also reduced.

Conversely, changing ensembles from wool to cotton resulted in an increase in scores.

## Conclusion

Superfine merino wool may assist in the management of childhood atopic dermatitis. (Clinicaltrials.gov Identifier:NCT02534428).

## INTRODUCTION

### Background

Atopic dermatitis (AD) is a chronic relapsing, pruritic skin condition usually presenting early in childhood.<sup>1</sup> AD affects around 30% of children. Its prevalence varies geographically and is increasing in many countries.<sup>2,3,4</sup> Itch, sleeplessness, behavioural change and effects on activities of daily living contribute to disease burden. AD severity correlates inversely with quality of life. The familial impact of moderate and severe AD has been shown to exceed that of diabetes.<sup>5,6</sup>

Genetic, inflammatory, microbial and environmental factors contribute to the skin barrier defect in AD, which predisposes to allergen sensitization. AD is potentially the first step of the 'atopic march', leading to asthma and allergic rhinitis.<sup>7,8</sup> Given the prevalence, burden, and complications of AD, minimizing adverse environmental triggers could greatly benefit individuals, families, and healthcare systems.<sup>9</sup> Management is complex: irritant and allergen identification and avoidance, moisturisers, anti-inflammatories, bleach baths, antibiotics, wet dressings and sometimes systemic immunosuppression. Poor compliance, due to costs, time constraints and fear, complicates treatment. Better strategies for primary and secondary prevention are required.

Triggers for AD include heat, irritants and adverse climate.<sup>10,11</sup> Few studies have examined effects of clothing in AD. Patients are advised to avoid woollen clothing, as early commentaries indiscriminately described wool as 'spiky', overheating and irritant; these papers failed to distinguish between fibre types.<sup>12,13,14</sup> Rajka and Hanifin included 'wool' intolerance in their AD diagnostic criteria.<sup>15</sup> 39% of UK schoolchildren with AD believe that 'wool' exacerbates AD.<sup>16</sup> However, wool fibres vary in thickness. Improved fibre diameter specification and advanced processing have refined garment properties.<sup>17</sup> More itching is induced by contact with fibres of mean diameter 36 $\mu$ m compared with those of 20 $\mu$ m.<sup>18</sup> Prickle and itch are generally not sensed if woollen garment mean fibre diameters are under 19-21 $\mu$ m.<sup>19,20,21</sup> Merino wool is generally less than 24 micron ( $\mu$ m) in diameter. Basic Merino types include: strong (broad) wool 23-24.5 $\mu$ m, medium wool 19.6–22.9 $\mu$ m, fine 18.6–19.5 $\mu$ m, superfine 15.0–18.5 $\mu$ m and ultrafine <15 $\mu$ m.<sup>22</sup>

Wool fibres, composed of keratin, are the most hygroscopic of the common apparel fibres, allowing ready absorption and release of moisture vapour in the clothing microclimate to buffer humidity changes.<sup>23</sup> They hold up to 35% of their own weight in water, compared to ~25% for cotton and 2-3% for polyester.<sup>24</sup> Wool demonstrates superior properties of insulation, water absorbency, fire resistance and liquid repellency compared with other natural and manmade fibers.<sup>25</sup> Its thermoregulatory and moisture transport properties may possibly benefit AD patients, as skin barrier dysfunction leads to moisture and temperature dysregulation.<sup>26</sup>

A recent study supported the tolerability and possible benefit of merino wool clothing in adult AD.<sup>27</sup> The present study examines the effectiveness of superfine merino wool clothing in reducing AD severity in children aged 0-3 years compared with cotton clothing and assesses its tolerability and effect on quality of life in paediatric AD.

## **METHODS**

### **Study Approval**

The study was approved by the Royal Children's Hospital (RCH) institutional ethics committee (HREC34037A). Each parent or legal guardian provided written informed consent before any study-related procedures began. The trial is registered on the clinicaltrials.gov PRS system (Identifier:NCT02534428).

### **Study Population**

Patients were recruited from the RCH Melbourne dermatology clinic, a tertiary care center. Patients 0 to 3 years with mild to moderate AD, determined by a SCORing Atopic Dermatitis index (SCORAD)  $>1$  and  $\leq 50$ , with a legally acceptable representative capable of understanding the informed consent document and providing consent on their behalf, were eligible. Exclusion criteria were past adverse reactions to merino wool, anticipated inability to attend visits, and unstable eczema, defined by treatment escalation or increased topical anti-inflammatory use during the previous two months.

### **Study Design**

A single-center, randomized, outcome assessor-blinded, cross-over, prospective cohort study was conducted. Participants in the wool-first arm received 6 weeks of superfine merino wool clothing followed by six weeks of standard clothing whereas the cotton-first arm participants began with standard clothing followed by superfine merino wool. The standard clothing of all participants was made of cotton.

Demographic and contact details were ascertained at the initial appointment. Children were reviewed 3-weekly. Participants in the wool-first group received 5 ensembles of 100% superfine merino wool clothing to be worn for at least 6 hours a day, based on realistic wear patterns, and Eco wool wash™ detergent. A further ensemble was given at Week 3. Participants in the cotton-first group received superfine merino wool clothing

at Week 6 (5 ensembles) and at Week 9 (1 ensemble). At each review, clothing type, duration of daily wear and AD treatments used during the preceding 3 weeks, were recorded. At 6 weeks, children in the wool-first group changed from wool to cotton clothing, with recollection of wool ensembles, while those in the cotton-first group changed from cotton to wool. At week 12, Merino ensembles were returned to families. Travel expenses were reimbursed.

AD management was standardised to minimise confounding variables. Standard RCH AD management includes moisturisation of the full skin surface at least twice daily, including after daily baths, hydrocortisone 1% ointment, pimecrolimus (in infants >3months) or tacrolimus (in children > 2years) to facial eczema twice daily as required, and mometasone (0.1%) or methylprednisolone (0.1%) to body eczema, wet dressings, and anti-bacterial measures as required.

### **Randomization and blinding**

Patients were assigned by a non-scoring investigator (RD,EL,LT), using a computer-generated random allocation list by block randomization with variable block size between 4 and 8 on a 1:1 schedule (SD,RD), to the wool-first or cotton-first arm.

Participants were assigned a study number, 1-40, during screening. The allocation list, sequentially numbered de-identified patient files, and corresponding clothing ensembles were locked in a departmental cabinet, only accessed by non-scoring investigators (RD,EL,LT). Participants were allocated to an unblinded dermatology nurse (EL,LT) for consultations. A separate blinded, trained researcher assessed each patient's SCORAD and the Atopic Dermatitis Severity Index (ADSI), at recruitment and on review (SH,JS). Where possible, the same investigator who performed the baseline score scored the child on reviews. During assessments, the nurse stored clothing away to prevent unblinding of assessors. Participants and guardians were unblinded but instructed to conceal their study arm from assessors.

### **Assessments**

The primary outcome was change in AD severity, measured using the objective components of the SCORAD (oSCORAD) after six weeks of intervention. Secondary Outcomes were eczema severity using the oSCORAD after three weeks and ADSI and



quality of life assessment using the Infant's Dermatitis Quality of Life Index (IDQOL) after three and six weeks of intervention. At the initial appointment and at each review, parents completed the IDQOL survey. An independent, blinded assessor administered the SCORAD and ADSI. Topical steroid (TS) use was recorded at each review.

The SCORAD is the most tested measure of AD severity, with reliability and validity shown by fifteen studies.<sup>28,29</sup> It measures global severity with a scale from 0-103, based on disease extent, six morphological parameters and two subjective markers.<sup>29</sup>

The ADSI assesses localized eczema severity by scoring a particular target area; the assessor selected the most severely affected area reliably in contact with clothing. Erythema, pruritus, exudation, excoriation, and lichenification are scored on a scale of 0 to 3 to give a maximum score of 15, high scores indicating increased severity. It has demonstrated sensitivity and correlates well with instrumental AD measurements including transepidermal water loss.<sup>28,29</sup>

The IDQOL score adapted the Dermatology Quality of Life Index (DLQI) for children below four years of age.<sup>25</sup> Caregivers rate a child's AD severity using subjective domains like eating, bathing, mood change and sleep disturbance.<sup>28,31</sup> The total score for ten questions ranges from 0 to 30; higher scores indicate greater disease burden.

Compliance was assessed, by noting the frequency and daily duration of garment use at each review for the preceding 3-week period. Daily diaries were supplied to document garment use and collected at each review.

### **Sample size calculation**

A sample size of 36 (18 participants per group) was selected to allow the detection of a clinically important greater reduction in SCORAD from baseline to six weeks of 8.2 units<sup>32</sup> in the wool ensemble clothes compared to the cotton clothes, assuming a standard deviation for change of 8.7, based on previously published estimates, power of 0.8, and an alpha level of 0.05.<sup>32</sup> To allow for a drop-out rate of up to 10%, a total of 20 participants per group was required.<sup>33</sup>

## **Statistical analysis**

All analyses were performed using the intention-to-treat principle. The mean oSCORAD, ADSI and IDQOL were examined. As the change in SCORAD scores were normally distributed, independent group t-tests using mean differences were used. A secondary analysis using non-parametric Mann-Whitney U test was also performed for SCORAD, ADSI and IDQOL, and the results were similar. Additionally, a generalized linear model was used (using a Gaussian family and an identity link function) to estimate the effect of wool on change in SCORAD from baseline, whilst adjusting for the child's sex and age. An interaction term was fitted with the group (wool vs cotton first) to test if the effect varied by order of treatment.

## **RESULTS**

### **Recruitment**

39 patients with mild to moderate AD were enrolled between 10 June 2014 and 10 February 2015. 20 were assigned to the wool-first arm and 19 to the cotton-first arm. Participants ranged in age from 1 month to 3 years at the time of recruitment. Figure 1 shows the consort flow diagram.

### **Baseline data**

At baseline, there were some differences between the cotton-first and wool-first groups (Table 1). Children in the wool-first group were younger and had a greater proportion with fathers with a history of hay-fever. Gender and markers of AD severity appeared similar between the groups.

### **Compliance with clothing use**

During the 6-week treatment period, woollen clothing use was reasonably high. Of children with available data in the wool-first group, 17/18 at 3 weeks and 15/15 at 6 weeks reported daily woollen garment use. Similarly, the figures for the cotton-first (wool-second) group were 15/17 and 13/16 at 9 and 12 weeks. Daily usage diaries were properly completed at 3 and 6 weeks for 16/18 and 12/15 children respectively of the wool-first group and 11/17 and 10/16 children respectively of the cotton-first group. According to diaries, 6-hour-minimum daily wear-times were satisfied in over 85% of participant-days in both groups.

## Outcomes

Primary outcome: SCORAD

SCORAD decreased from baseline to week 12 in both groups, but this was more pronounced in the cotton-first group (Fig. 3, Table 3). There was limited improvement in SCORAD from baseline to week 6 in both groups (Table 2) with no evidence that the SCORAD change was different between the two groups (Table 3). The cotton-first group showed substantial reduction in eczema severity after changing to wool, from 6 to 9 and again to 12 weeks (mean of 11 to 13 point reduction). No improvement occurred in the wool-first group after changing to cotton, with a trend towards worsening AD from 6 to 12 weeks (Table 2, Fig. 2).

Generalized linear modelling confirmed these findings. Combining the wool period data of both groups, the magnitude of SCORAD reduction from baseline was greater at six weeks of treatment (-7.6, 95%CI=-10.4, -4.8) than at three weeks (-2.5, 95%CI= -4.7,-0.4). Neither age at enrolment (p=0.69) nor sex of the child (p=0.99) were associated with change in SCORAD, while higher baseline SCORAD values were associated with greater reduction in SCORAD (p<0.01) during the follow-up. These effects were not greatly altered when adjusted for age, sex, and baseline severity (-2.6, 95%CI= -4.6,-0.62 at three weeks and -7.2, 95%CI=-9.4,-5.0). While the impact of the wool garments appeared greater in the cotton-first group than the wool-first group, this was not significantly different at either Week 3 (p=.198) or Week 6 (p=0.634).

Secondary outcomes

ADSI (Table 2)

In parallel with the SCORAD observations, wool garment use was associated with a significant ADSI score reduction, particularly for the cotton-first group. Comparing the combined wool period data of both groups with baseline, a median ADSI score reduction of -1 (IQR -2,0) at 3 weeks (p<0.01) and -2 (-3, -1) at 6 weeks of use was observed (p<0.01). There was a trend towards worsening ADSI scores in the wool-first group when changed over to cotton.

## IDQOL

Significant falls in IDQOL scores were seen during wool intervention for the cotton-first group (Table 3). After combination of both groups, a reduction in mean and median scores during wool intervention remained (median= -1, IQR= -4.5, 0.5 at 3 weeks,  $p=0.03$  and -2, IQR= -4.5, -0.5 at 6 weeks,  $p=0.01$ ). Again, the wool-first group showed a rise in IDQOL scores when participants changed over to cotton (Table 2).

## TS use (Table 4)

Daily use of TS on the body was reduced when wearing wool, particularly for the cotton-first group. When combined across the time periods, children wearing wool had approximately a halving of daily body steroid use (OR=0.44, 95%CI=0.23-0.83), compared with wearing cotton. Facial TS use was inconsistently associated with wool garment wear. Moisturiser use, measured by daily frequency of applications, by contrast, did not consistently correlate with or overall significantly change with wool garment use.

## Adverse Events

No untoward medical occurrence was observed in this study, regardless of its causal relationship to study treatment, except for one child who withdrew after experiencing study-unrelated food allergy.

## Discussion

In this randomized cross over trial, wearing fine merino wool garments reduced oSCORAD with statistical significance and reduced TS use in mild and moderate AD. Children with severe AD were excluded due to its complications that could affect compliance and clothing effects in a short study. Eczema reduction was more pronounced in the cotton-first group, but remained significant when both groups were combined. No observed difference in garment use explained this possible difference between groups; compliance was high in both groups.

Various reasons may explain why wool garment effects appeared more substantial in the cotton-first group. First, the median age of children in the cotton-first group was 12 months older than those in the wool-first group. While AD severity naturally decreases

with increasing age, any age-related improvement in eczema generally takes years to occur and is unlikely to significantly impact a study with a 3-month follow-up period.

Second, patients in the cotton-first group completed more visits by the time they changed to wool, compared to the wool-first group. This may have created a run-in effect. Benefits of wool may thus possibly be greater when skin inflammation is less. Children in the cotton-first group benefited from a longer period of optimizing routine management before wool was introduced.

Third, environmental factors may have confounded results. Temperature variations may trigger AD flares. As the study ran from winter to summer, the cotton-first group would have tended to wear wool in warmer months; this may have influenced differences in the effects observed between the two groups. However, the mean daily temperatures between the groups were similar and could not explain these differences observed (Table 1). By contrast, children in the cotton-first group, who improved the most during treatment, had lower mean ( $p=0.06$ ) and maximum ( $p=0.03$ ) humidity levels during treatment. To formally test the contribution of humidity, we fitted an interaction between the treatment and humidity during the treatment period but did not find evidence that humidity modified the effectiveness of wool ( $p=0.60$ ). However, as power of our study was limited, potential interaction between environmental conditions and the effects of wool should be explored in future studies.

Notably, during the second phase, children in the wool-first group showed a worsening of AD back to baseline values when they switched from wool to cotton, from 6 to 12 weeks. This may indicate that cessation of wool use, reverting to cotton, results in a relative worsening of eczema, the reverse of findings for the group that changed from cotton to wool.

This study demonstrated not only a statistically significant reduction in AD severity with use of fine merino wool ensembles, compared to cotton over a six-week period, but also, with reduction in oSCORAD that may be of clinical significance. The estimated effect of woollen garments after six weeks of use was a reduction in oSCORAD of -7.6

units (95%CI= -10.4, -4.8), while a clinically important reduction in the SCORAD has been estimated to be 8.2 units.<sup>32</sup>

There are limitations in this study. First, children with severe AD were not included. Second, minimum wear time was short, based on realistic wear patterns in Melbourne, where dramatic climate changes can occur anytime. There may be differences in the time of wear and longer wear may have greater impact; this was not captured in the data. Third, we cannot totally exclude recall bias. Diary cards were mostly well completed to verify garment use, but were not used to quantify topical treatments, a limitation to address in future studies. Fourth, weaknesses of the SCORAD, the primary outcome measure, include inter and intra-assessor variability that lowers accuracy and reproducibility, particularly in assessing disease extent.<sup>29</sup> The HOME group consensus recently advocated the EASI score to assess AD severity, having potentially higher inter-rater and intra-rater reliability. Future studies should use this scale.<sup>34,35</sup> Fifth, while the trend to a clinically significant reduction in SCORAD was clear, our sample size was small, resulting in imprecise estimates of the merino clothing effect on oSCORAD. In retrospect, inclusion of 7 children (5 wool-first, 2 cotton-first) with oSCORAD<8 possibly also compromised the power to show clinically important oSCORAD reduction. A larger trial is required to confirm findings. Sixth, the follow-up period was relatively short. A longer period may clarify the greater effect observed in the cotton-first group. Seventh, geographical climatic variations may limit the generalizability of results to other countries.

In this study, superfine merino wool clothing reduced the severity of paediatric mild-moderate AD as compared to cotton clothing, suggesting its potential place in childhood AD management. Therefore, traditional management guidelines classing all wool-based clothing as irritants should be modified to include superfine merino wool as a recommended clothing choice in childhood AD. Further areas to study include the  and comparison studies with different textiles and fibre specifications. Future studies of superfine merino wool should consider children with severe AD, effects of longer wear times, other geographical climates and wool's potential to help prevent childhood AD.

## References

1. Eichenfield L, Tom W, Chamlin S, Feldman *et al.* Guidelines of care for the management of atopic dermatitis: section 1. Diagnosis and assessment of atopic dermatitis. *J Am Acad Dermatol* 2014; 70(2): 338-351.
2. Williams H. Atopic Dermatitis. *N Eng J Med* 2005; 352: 2314-24.
3. Asher M, Montefort S, Björkstén B *et al.* Worldwide time trends in the prevalence of symptoms of asthma, allergic rhinoconjunctivitis, and eczema in childhood: ISAAC Phases One and Three repeat multicountry cross-sectional surveys. *Lancet* 2006; 368, 9537: 733-43.
4. Draaisma E, Garcia-Marcos L, Mallol J *et al.* A multinational study to compare prevalence of atopic dermatitis in the first year of life. *Pediatr Allergy Immunol* 2015; 26(4): 359-66.
5. Ben-Gashir M, Seed P, Hay R. Are quality of family life and disease severity related in childhood atopic dermatitis? *J Eur Acad Dermatol Venereol* 2002; 16(5): 455-62.
6. Su JC, Kemp AS, Varigos GA *et al.* Atopic eczema: its impact on the family and financial cost. *Arch Dis Child* 1997; 76(2): 159-62
7. Hogan M, Peele K, Wilson N Skin Barrier Function and Its Importance at the Start of the Atopic March. *J Allergy*, 2012: 1-7.
8. Leung D. New Insights into Atopic Dermatitis: Role of Skin Barrier and Immune Dysregulation. *Allergol Int* 2013; 62(2): 151-161.
9. Dharmage SC, Lowe AJ, Matheson MC *et al.* Atopic dermatitis and the atopic march revisited. *Allergy* 2014; 69:17-27.
10. Langan S, Silcocks P, Williams H. What causes flares of eczema in children? *Br J Dermatol* 2009; 161(3): 640-6.
11. Silverberg J, Hanifin J, Simpson E. Climatic Factors Are Associated with Childhood Eczema Prevalence in the United States. *J Invest Dermatol* 2013; 133(7): 1752-9.
12. Hill LW. Wool as a cause of eczema in children. *N Eng J Med* 1951; 245:407-9.
13. Werfel T, Kapp A. Environmental and other major provocation factors in atopic dermatitis. *Allergy* 1998; 53: 731-9.
14. Gelmetti C, Wollenberg A. Atopic dermatitis- all you can do from the outside. *Br J Dermatol* 2014; 170(S1):19-24.
15. Hanifin JM, Rajka G. Diagnostic features of atopic dermatitis. *Acta Dermato-Venereol Suppl* 1980; 92: 44-7.
16. Williams JR, Burr ML, Williams HC. Factors affecting atopic dermatitis- a questionnaire survey of schoolchildren's perceptions. *Br J Dermatol* 2004; 150: 1154-61.
17. Sun R-J, Chen M-Y, Yao M *et al.* Study on the thick tip of lamb's wool of superfine merino wool. *Text Res J* 77(12): 964-7.
18. Bendsøe N, Björnberg A, Åsnes H. Itching from wool fibres in atopic dermatitis. *Contact Derm* 1987; 17(1): 21-2.
19. Garnworthy RK, Gully RL, Kandiah RP *et al.* Identification of the physical stimulus and neural basis of fabric-evoked prickle. *Neurophysiol* 1988; 59: 1083-97.
20. Naylor GRS, Veitch, CJ, Mayfield, RJ *et al.* Fabric-evoked prickle. *Text Res J* 1992; 62(8): 439-87.

- Accepted Article
21. McGregor BM, Naebe M, Stanton J *et al.* Relationship between wearer prickle response with fibre and garment properties and Wool Comfort Meter assessment. *J Text I* 2013; 104(6): 618-27.
  22. Australian Wool Corporation. Australian Wool Classing: a text for the modern professional. Melbourne: AWC 1990: 26.
  23. Li Y, Holcombe BV, Apcar F. Moisture buffering behaviour of hygroscopic fabric during wear. *Text Res J* 1992; 62(11): 619-27.
  24. Rae A, Bruce R. The Wira Textile Data Book. Leeds: WIRA, 1973.
  25. Rogers GE. Biology of the wool follicle: an excursion into a unique tissue interaction system waiting to be re-discovered. *Exp Dermatol* 2006; 15(12): 931-49.
  26. Darlenski R, Kazandjieva J, Tsankov N. Is there an increased skin irritation and contact sensitization in atopic dermatitis? *Expert Rev Dermatol* 2011; 2: 229.
  27. Griplas L. Changing Perceptions of Wool. Sydney: Woolmark, 2012. Available from: <<http://www.woolmark.com/dermatitis-study>>. [8 May 2014].
  28. Schmitt J, Langan S, Williams H. What are the best outcome measurements for atopic eczema? A systematic review. *J Allergy Clin Immunol* 2007; 120(6): 1389-98.
  29. Holm E, Wulf H, Thomassen L *et al.* Assessment of atopic eczema: clinical scoring and noninvasive measurements. *Br J Dermatol* 2007; 157(4): 674-80.
  30. Ben-Gashir, M. Relationship between quality of life and disease severity in atopic dermatitis/eczema syndrome during childhood. *Curr Opin Allergy Clin Immunol* 2003; 3(5): 369-73.
  31. Lewis-Jones M, Finlay A, Dykes P. The Infants' Dermatitis Quality of Life Index. *Br J Dermatol* 2001; 144: 104-10.
  32. Schram ME, Spuls PI, Leeflang MM *et al.* EASI, (objective) SCORAD and POEM for atopic eczema: responsiveness and minimal clinically important difference. *Allergy* 2012;67:99-106.
  33. Lehmann EL. Nonparametrics : Statistical Methods Based on Ranks. New York: Springer-Verlag, 1998.
  34. Chalmers JR, Schmitt J, Apfelbacher C *et al.* Report from the third international consensus meeting to harmonise core outcome measures for atopic eczema/dermatitis clinical trials (HOME). *Br J Dermatol* 2014; 17(6): 1318-25.
  35. Zhao CY, Tran AQ, Lazo-Dizon JP *et al.* A pilot comparison study of four clinician-rated atopic dermatitis severity scales. *Br J Dermatol* 2015; 173(2): 488-97.



**Table 1.** Baseline characteristics of study participants.

	Cotton First	Wool first
<b>Participant Characteristics</b>		
% Males	68.4% (13/19)	60.0% (12/20)
Median (IQR) age at enrolment	22 (4-34)	10 (7-21)
<b>Eczema Severity</b>		
Median Baseline SCORAD (IQR)*	15.5 (10.5-20.5)	11 (7-19)
Mean Baseline SCORAD (sd)	16.6 (0.6)	13.4 (7.9)
Median Baseline ADSI (IQR)*	4 (2-5)	3 (2-4)
Median Baseline IDQOL (IQR)*	8.5 (5-10)	7 (4-11)
<b>Comorbid disease</b>		
% asthma	5.3% (1/19)	15.0% (3/20)
% hay fever	15.8% (3/19)	25.0% (5/20)
<b>Family history</b>		
<b>Mother</b>		
% Eczema (n/N)	42.1% (8/19)	35.0% (7/20)
% Asthma (n/N)	15.8% (3/19)	20.0% (4/20)
% Hay fever (n/N)	47.4% (9/19)	45.0% (9/20)
<b>Father</b>		
% Eczema (n/N)	31.6% (6/19)	45.0% (9/20)
% Asthma (n/N)	31.6% (6/19)	30.0% (6/20)
% Hay fever (n/N)	31.6% (6/19)	70.0% (14/20)
<b>Sibling</b>		
% Eczema (n/N)	42.1% (8/19)	30.0% (6/20)
% Asthma (n/N)	15.8% (3/19)	10.0% (2/20)
% Hay fever (n/N)	21.1% (4/19)	5.0% (1/20)
<b>Mean (sd) daily environmental conditions*</b>		
Temperature during treatment phase	18.2 (2.8)	19.2 (1.7)
Temperature during control phase	18.5 (2.6)	18.1 (2.7)
Humidity during treatment	64.9 (1.9)	66.9 (4.0)
Humidity during control	66.8 (3.7)	65.5 (2.4)

\*Calculated as the mean daily temperature or humidity ((daily minimum + daily maximum)/2) for the six-week intervention or control period.

**Table 2.** Median (IQR) and Mean (sd) SCORAD, ADSI and IDQOLscore according to group of assignment. Area in grey indicates active treatment with wool ensemble.

Group		Baseline	3 weeks	6 weeks	9 weeks	12 weeks
Cotton First standard-wool SCORAD	Median (IQR)	15.5 (10.5-20.5)	10 (7-15)	11.5 (11-15)	4 (4-7)	2 (0-4)
	Mean (sd)	16.6 (8.7)	11.6 (8.5)	13.3 (8.2)	6.9 (6.6)	3.9 (7.0)
	n	16	18	18	17	16
Wool First wool-standard SCORAD	Median (IQR)	11 (7-19)	11 (4-14)	7 (4-11)	11 (7-12)	9.5 (7-19)
	Mean (sd)	13.4 (7.9)	10.3 (7.3)	8.1 (8.7)	11.6 (6.1)	13.5 (10.4)
	n	19	19	17	17	14
Cotton First ADSI	Median (IQR)	4 (2,5)	2 (1,4)	2 (1,3)	0 (0,2)	0 (0,0.5)
	Mean (sd)	3.7 (2.0)	2.4 (1.9)	2.4 (2.2)	1.1 (2.2)	0.7 (1.8)
	n	15	19	15	14	16
Wool First ADSI	Median (IQR)	3 (2,4)	0 (0,3)	1 (0,3)	1.5 (0,3)	2 (0,3)
	Mean (sd)	3.0 (1.6)	1.9 (2.7)	1.6 (2.3)	2.1 (2.5)	2.3 (2.4)
	n	15	17	14	14	14
Cotton First IDQOL	Median (IQR)	8.5 (5,10)	5.5 (4,8)	4 (3,5)	4 (3,5)	2 (1,5)
	Mean (sd)	8.2 (3.6)	6.7 (4.2)	4.4 (2.2)	4.3 (2.6)	3.0 (3.3)
	n	14	16	11	13	15
Wool First IDQOL	Median (IQR)	7 (4,11)	4 (2,6)	2 (2,8)	7 (3,10)	5 (2,8)
	Mean (sd)	7.6 (4.5)	4.8 (3.5)	4.5 (4.1)	6.8 (4.6)	5.8 (4.5)
	n	15	19	13	15	14

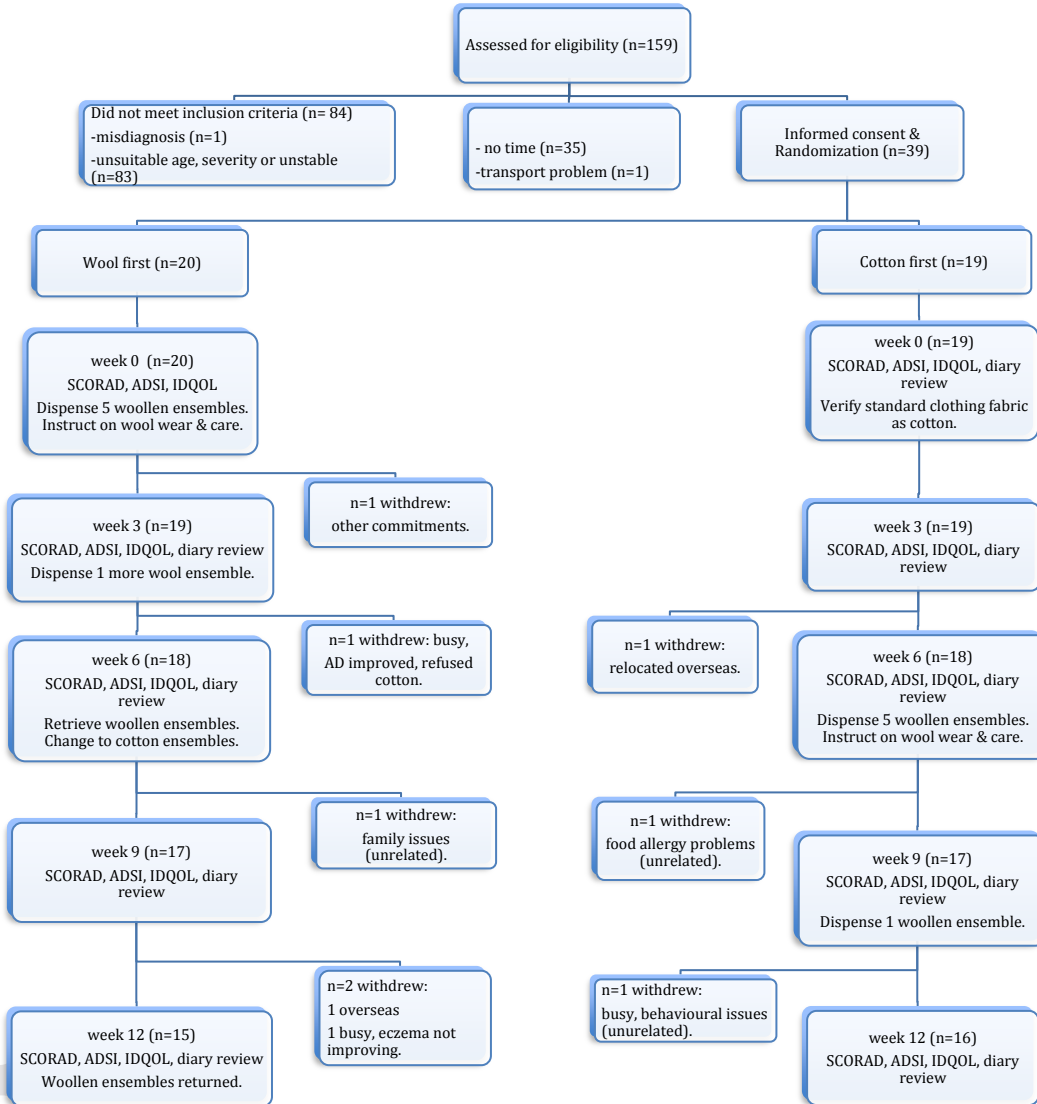
**Table 3:** Median (IQR) & mean (sd) Change in Objective SCORAD, ADSI and IDQOL FROM BASELINE according to group of assignment. Area in grey indicates active treatment with wool ensemble.

Group		3 weeks	6 weeks	9 weeks	12 weeks
Cotton First standard-wool SCORAD	Median (IQR)	-4.5 (-11, -3)	-4 (-7, 0)	-10.5 (-16, -7)	-13 (-17, -11)
	Mean (sd)	-6.6 (7.3)	-4.4 (8.6)	-11.0 (7.8)	-13.2 (6.8)
	n	16	15	14	13
	P value*	0.20	0.56	<0.01	<0.01
Wool First wool-standard SCORAD	Median	-3 (-10, 4)	-6 (-13, 0)	-1 (-4, 4)	0 (-4, 7)
	Mean (sd)	-3.1 (8.4)	-6.2 (9.5)	-1.4 (6.4)	1.3 (6.1)
	n	19	17	17	14
	P value*	0.89	0.90	0.12	<0.01
Cotton First ADSI	Median (IQR)	-1 (-3.5,0)	-2 (-4,-1)	-3 (-4,-2)	-4 (-4,-3)
	Mean (sd)	-1.5 (2.4)	-2.2 (1.9)	-2.7 (1.5)	-3.4 (1.7)
	n	15	12	11	13
	P value*	0.89	0.90	0.12	<0.01
Wool First ADSI	Median	-1 (-3,0)	-2 (-4,0)	-1 (-3,0)	-1 (-2,0)
	Mean (sd)	-1.5 (2.0)	-2.1 (2.1)	-1.5 (2.0)	-0.9 (0.9)
	n	13	11	10	10
	P value*	0.46	0.63	0.02	0.01
Cotton First IDQOL	Median (IQR)	-4 (-5,3)	-6 (-8,-4)	-6 (-7,-2)	-6 (-10,-4)
	Mean (sd)	-1.6 (5.6)	-5.9 (2.3)	-4.8 (3.0)	-6.0 (3.6)
	n	13	7	9	10
	P value*	0.46	0.63	0.02	0.01
Wool First IDQOL	Median	-2 (-6,-1)	-6 (-8,-1)	-1 (-2,1)	-1 (-2,1)
	Mean (sd)	-3.3 (3.9)	-4.6 (4.5)	-0.6 (3.5)	-1.4 (2.8)
	n	15	9	11	10
	P value*	0.46	0.63	0.02	0.01

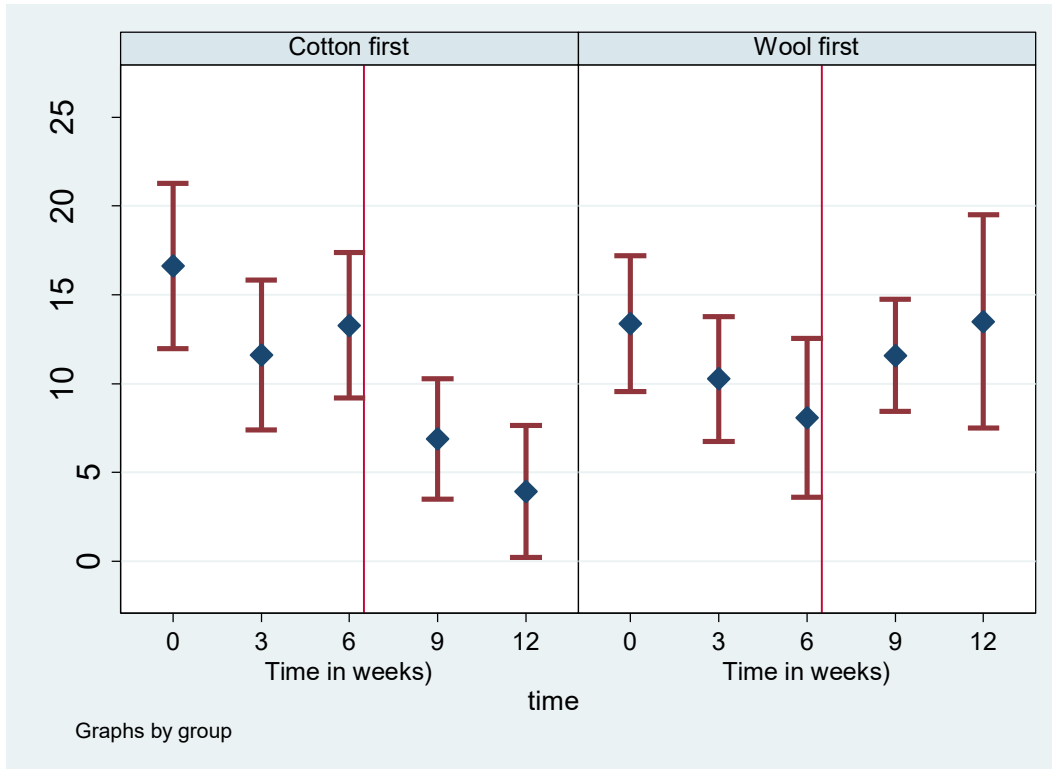
**Table 4.** Proportion treated at least daily with topic steroids according to group of assignment. Area in grey indicates active treatment with wool ensemble.

Steroid use on body					
Group		3 weeks	6 weeks	9 weeks	12 weeks
Cotton First	Proportion (n/N)	53% (10/19)	31% (5/16)	24% (4/17)	6% (1/16)
Wool first	Proportion (n/N)	28% (5/18)	33% (5/15)	(7/17)	33% (5/15)
	p	0.18	1	0.47	0.08
Steroid use on face					
Group		3 weeks	6 weeks	9 weeks	12 weeks
Cotton First	Proportion (n/N)	5% (1/19)	12.5% (2/16)	18% (3/17)	0% (0/16)
Wool first	Proportion (n/N)	11% (2/18)	27% (4/15)	41% (7/17)	27% (4/15)
	p	0.60	0.40	0.26	0.04

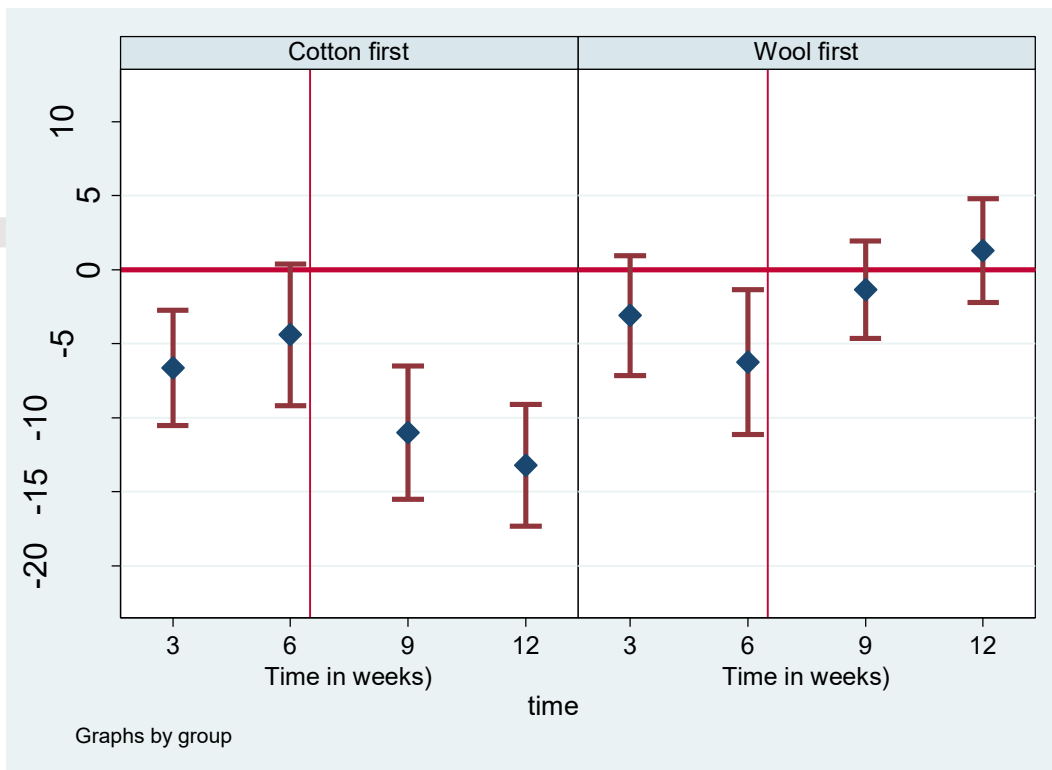
**Figure 1** Consort flow diagram



**Figure 2:** Mean (95%CI) Objective SCORAD according to group of assignment. Vertical lines indicate change over from cotton to wool or wool to cotton.



**Figure 3:** Mean (95%CI) change in Objective SCORAD FROM BASELINE according to group of assignment.



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# AWI Woolgrower Industry Consultative Committee (ICC)

MEETING SUMMARY – 12 October 2017, Hamilton SA



## Purpose of AWI's Woolgrower Industry Consultative Committee (ICC)

The purpose of AWI's ICC enables AWI to formally consult with woolgrower representative organisations, allowing them to provide feedback on priorities from their members, and for AWI to report on its performance and plans. These priorities guide AWI's investment and activities.

### ATTENDEES

Representative	Position	Organisation
Wal Merriman	Chair	AWI
Georgina Wallace	President	Australian Association of Stud Merino Breeders
Bill Crawford	Representative	Australian Superfine Wool Growers Association
Robert McBride	Representative	Australian Wool Growers Association
Brenton Lush	Representative	Broad wool breeds
Bindi Murray	Representative	Pastoralists and Graziers Association of Western Australia
Richard Halliday	President	WoolProducers Australia
Joe Keynes	Observer	Livestock SA
Geoff Power	Guest participant	Flinders Merino
Rob Solomon	Director, Wool & Dairy Policy	Department of Agriculture and Water Resources (DAWR)
Stuart McCullough	CEO	AWI
Peta Slack-Smith	General Manager Corporate Affairs & Market Access	AWI
Emma Gittoes	Corporate Affairs Manager	AWI

## Welcome and general business

### General business

- All members raised concerns around AWI Chairman's role at a recent AWI focus group where he observed participants behind a mirror. After lengthy discussion and a detailed explanation from AWI – which outlined that the AWI Chair was directed by the market research company Axiom to sit behind the mirror as an observer with a representative from Axiom and AWI. All ICC members listened to the explanation provided and recommended the AWI Chairman write an apology to the participants.
  - AWI Chairman wrote an apology to participants on 18 October.
- All members commended the improvements AWI had made to the ICC meetings over the past 12 months, including the briefing packs provided by AWI. Members agreed to seek feedback from their organisations on WPA's proposal to reform AWI's ICC and revert at the next meeting. AWI informed the ICC that WPA's reform proposal had been tabled at the AWI Board meeting prior, and received no support from the AWI Board. DAWR noted that the SFA aims to ensure consultation between AWI and grower groups, however it does not direct how that is to be achieved. It was noted that AWI and DAWR facilitated a workshop in June 2016 with the ICC members, with those suggestions incorporated into ICC meetings.



## 1.1 Review minutes from previous meeting

- All members agreed the 1 June ICC meeting minutes were an improvement and would like to see this format moving forward, with the addition of assigning comments to specific members.

## 1.2 Review actions from last meeting

- In response to the Action Item for WPA to report back on AWEX's response to the issues raised by members ICC around the adequacy of wool classer training, it was agreed that a joint letter from all ICC members would be sent to AWEX to raise issues directly.
- All other action items were confirmed to be completed or addressed with no issues raised.

## ICC members report on their members' priorities

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AWI invited ICC members to provide their member's research, development and marketing priorities for AWI. AWI's Statutory Funding Agreement (SFA) with the Australian Government requires AWI to provide responses to the items raised in the ICC meeting record. The following summarises those priorities and AWI's response.

### *Australian Association of Stud Merino Breeders (AASMB) – Georgina Wallace*

- Affirmed that all the issues listed from 2016/17 included in the AWI briefing pack are still priorities.
- Tabled letters expressing concern at the decline of AI results and decline of skilled wool classers, with a view that AWI should be pursuing wool classer training.
  - AWI provided an update on the AI projects it is currently working on, including a new project with new funding to improve the success of AI. It was agreed by all ICC members that wool classer issues would be raised in a joint letter to AWEX. It was agreed by ICC members that a letter would be drafted and circulated to the ICC members with the draft minutes for their review and endorsement. It was agreed that the logos of ICC members would appear on the letter, but not that of AWI.
- AWI's work with shearers, shed hands and jackeroo's seen as important.
- Would like to see a national approach to OJD and to Ovine Brucellosis and a response from Government.
  - DAWR to report back to DAWR Biosecurity team and provide response at next ICC meeting.

### *Australian Superfine Wool Growers Association (ASWGA) – Bill Crawford*

- Affirmed that all the issues listed from 2016/17 included in the AWI briefing pack are still priorities.
- Mulesing big concern with pressure from overseas consumers – need to be proactive, but noting quality will still be a major demand driver.
  - AWI undertakes annual meetings with retailers and animal welfare stakeholders to inform them of AWI and the wool industry's R&D progress and activities to ensure sheep health and welfare. AWI also regularly surveys consumers in major wool markets to monitor and respond to consumer sentiment.
- Noted the success of AWI's LTEM program and would like to see greater availability in New England region.
  - AWI noted that it has funded 20 new LTEM trainers across the country, 2 of which are located in the New England region.

### *Australian Wool Growers Association (AWGA) – Rob McBride*

- Affirmed that all the issues listed from 2016/17 included in the AWI briefing pack are still priorities.
- Concerned with slow industry adoption rates of breech strike R&D. Need more advocacy from AWI to increase adoption of breech strike genetics and genomics R&D in studs, increase pain relief use nationally and inform consumers about R&D and industry progress.
  - AWI reminded ICC members that it is not AWI's role to mandate or create policy for the industry. AWI has been investing in breech strike R&D for many years as it's a top priority for growers, however adoption of the R&D is an individual business decision for growers. AWI recently created the new position of Sheep Health and Welfare Advocacy Manager to specifically focus on breech strike R&D extension to growers.
- Believe AWI are not exploring all options for new shearing technology, and have rejected proposals from Adelaide University.

- AWI has committed to allocate additional resources to its wool harvesting program to fast track shearing innovations. Following a consultation forum in Dubbo in May this year, AWI has developed a short, medium and long-term plan for its wool harvesting program that will address OH&S (such as shed design and catch and drag), efficiencies around wool at the table, mobile shearing, multifunction sheds and robotics. AWI has conducted a national and global search for new wool harvesting technology ideas, however Adelaide University did not submit a proposal. AWI has since been in contact with Adelaide University to further discuss their capacity in this area.
- Update on ear tags, including when they will be on the market.
  - AWI noted that trials of its ear tag technology have been successful and they will be available in the market once there is confidence that the product is reliable and ready for commercial use.

*Broad wool breeds – Brenton Lush (Australian Corriedale’s Association)*

- Affirmed that all the issues listed from 2016/17 included in the AWI briefing pack are still priorities.
- Wool over 30 micron is currently not trading well.
  - AWI invests in broad wool through the Campaign for Wool, which has a focus on interiors. AWI is aware there is a stockpile from other broad wool producing countries, which is having a major impact on prices.
- With feedback from market reports suggesting a premium for better prepared lines, want to better understand what goes into to this and how to better prepare lines.
  - It was agreed that ICC members would include questions on line preparation in the letter to AWEX.
- Whether the Wool Exchange Portal (WEP) will be a lower cost selling option and enable growers to combine lots of wool.
  - AWI confirmed the WEP will enable growers and other market participants to compare available options and choose selling and buying strategies best suited to individual circumstances.

*Pastoralists and Graziers of WA (PGA) – Bindi Murray*

- Affirmed that all the issues listed from 2016/17 included in the AWI briefing pack are still priorities.
- AWI’s work in wild dogs is having a good impact – continue to support program.
- Would like an update following AWI’s Animal Welfare Forum in May, particularly on genomics around welfare traits.
  - AWI is currently working on a summary of the updated breech flystrike strategy which will be circulated soon.
- While PGA do not agree with more money being invested in marketing than R&D, would like to better understand the purpose, outcomes and measurements of marketing activities.
  - AWI to host a marketing workshop at the next AWI ICC meeting in Sydney to better explain its marketing activities and the monitoring and evaluation process and welcomes feedback from ICC members on how best to explain outcomes of marketing meaningfully to growers.
- Request for update on consumer sentiment around animal welfare.
  - AWI noted the focus of retailer and animal welfare stakeholders from the most recent meetings in North America and Europe was on traceability, which can be achieved through the NWD. AWI also regularly surveys consumers in major wool markets to monitor and respond to consumer sentiment.

*WoolProducers Australia (WPA) – Richard Halliday*

- Affirmed that all the issues listed from 2016/17 included in the AWI briefing pack are still priorities.
- Working with external groups on drug policies, with posters prepared for the industry. Would like AWI to circulate posters in Beyond the Bale magazine.
  - AWI agreed to include the poster in its quarterly magazine, Beyond the Bale.
- Update on the carcass evaluation project.
  - AWI’s on-farm team are currently developing a project to look at the lifetime assessment of wethers for live carcass traits.
- Observing the development of the Responsible Wool Standards.

- Requested AWI review decision not to fund a WA Shearing Industry Association project proposal that assisted growers to meet OH&S requirements by having shearing contractors audit their sheds.
  - AWI agreed to relook at the proposal, however with a slight shift in scope from undertaking audits on farms, to helping growers prepare their sheds for audits. PGA advised WorkSafe WA already provide checklists that growers can use to prepare their sheds.
- Requested a personal interest declaration be established for ICC members.
  - AWI agreed to circulate a form through which ICC members can declare what committees they sit on and positions they hold in other organisations.

#### *Flinders Merino – Geoff Power*

- Main priority is wild dogs. Complimentary of AWI's ongoing commitment to wild dog control and the results it has achieved for industry.
- Need for ongoing training of shearers/shed hands and classers and innovation in wool harvesting technology.
  - AWI noted that wool harvesting innovation is a major focus of the Board.
- Need for education for young people coming into the industry.
  - AWI has programs, such as the National Merino Challenge, specifically targeting young people.

#### **Update from Department of Agriculture, Water and Resources**

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- DAWR currently undergoing restructure.
- Another Rural R&D For Profit Program round is expected to open in 2018, with \$100 million still available. AWI are involved in 4 projects.
- On AWI's compliance with the SFA, DAWR advised that the governance frameworks that AWI operate under are the same as what apply to any corporation in Australia. In addition to this, AWI has had to put in place numerous structures in order to meet requirements under the SFA including; an independent Review of Performance, a skills-based Board, independence in Board Committees, reporting to Senate Estimates Committee, 6 monthly SFA compliance reporting to DAWR and annual compliance audit reports. Government then provide feedback to AWI on whether there are any compliance concerns. DAWR have noted there were no compliance issues raised to date with AWI.
  - AWI noted the processes it undertakes to monitor compliance and reports these to DAWR every six months.

#### **AWI report back - current activities and finances**

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AWI briefed ICC members on the following:

- AWI's 2016/17 Annual Report has been finalised. The Report shows a surplus, with an underspend on projects and increased revenue. Consistent with AWI's Annual Operating Plan (AOP), the AWI Board continues to monitor reserves.
- The Wool Exchange Portal (WEP) is currently in the build phase. AWI has become aware of 3 new digital platforms being developed, 2 from Chinese trading companies and 1 from Australian Wool Handlers, which AWI believes will work in synergy with the WEP. AWI are committed to ensuring the WEP remains in the control of woolgrowers. The Intellectual Property will remain with AWI and licensed to a new company, with the ownership structure to mimic the structure of AWI. AWI will provide growers an insight at AWI's AGM on November 17.
- Latest marketing activities include;
  - development of a global direct-to-consumer marketing campaign to promote the benefits of wool
  - Gondolier project in Italy - dressing Gondoliers in wool
  - working with major car companies to look at fabric innovations for car seats
  - joint campaign with the World Surfing League to promote wool in sportswear
  - joint campaign with the Wallabies and Cricket Australia following the success of the Fibre of Football (AFL) campaign
  - working with Livia Firth (Eco-Age) to tell the environmental story of wool
- AWI also provided a progress update on the range of projects in its Sheep Production R&D portfolio.