Understanding maternal Merino sheep resilience to stress using wool hormone monitoring, epigenetics and Smart tags

E. J. Narayan[A,B,D], D. Fox[A], G. Sawyer[C] and A. Tilbrook[B]

[A] School of Agriculture and Food Sciences, Faculty of Science, The University of Queensland, St Lucia, Qld 4067, Australia
[B] The Queensland Alliance for Agriculture and Food Innovation, The University of Queensland, St. Lucia, Queensland 4067, Australia
[C] The University of Sydney, NSW 2006, Australia
[D]Email: e.narayan@uq.edu.au

Farm animal productivity can be influenced by climatic and management factors, and stress can influence animal development, growth and reproduction (Aggarwal and Upadhyay, 2012). Quantitative biomarkers of physiological stress using wool hormone monitoring enables the rapid assessment of the physiological condition of farm animals under current environmental conditions (Sawyer et al., 2019).

In this study, we aimed to test the influence of shearing frequency (twice shorn versus single shorn) on the reproductive performance of gestating Merino ewes managed under natural climatic conditions in a sheep property in NSW, Australia. We used minimally invasive hormone monitoring technique (wool sampling) to determine cortisol levels (Figure 1.0).

We present some of the outcomes of this pilot trial to discuss if/how shearing frequency influences body condition score of maternal ewes, and using wool hormone monitoring to detect stress levels. We discuss the differences in wool glucocorticoids (stress hormone) levels between twice versus single shorn ewes. Furthermore, we also determined the differences in percentage lamb survival and wool quality indicators of the lambs and discuss between shearing group differences in molecular epigenetic signatures in the ewes and their lambs.

Our analysis for molecular epigenetic testing and Smart tags is on-going to collectively gather new information on the physiology and behaviour of ewes throughout gestation and post-lambing.

Figure 1. Mean $\pm$ wool cortisol profiles of Merino ewes (n = 23-36 ewes in each time period) during gestation from the two treatment groups. Level of significant difference was found between treatment groups (twice versus single shearing) for the month of May 2019 (lambing in June 2019) using a t-test for comparison of sample means.

Overall, the results of this pilot trial show the potential applications of minimally invasive hormone and molecular tools, and the application of Smart tags for assessing the physiology and behaviour of sheep during crucial periods under natural on-farm conditions, and also determines whether shearing frequency can improve productivity gains in Merino sheep.

References
Aggarwal, A. and Upadhyay, R., 2012. Heat stress and animal productivity. Springer Science & Business Media.
Sawyer, G., Webster, D. and Narayan, E., 2019. Measuring wool cortisol and progesterone levels in breeding maiden Australian merino sheep (Ovis aries). PloS one, 14(4).