

2013 Honours Project Outcomes - University of Tasmania

Project: *Wool Quality and Liveweight Response to Omega-3 Fatty Acid Enriched Supplements in Genetically Divergent Lambs*

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Primary Objectives:

This project aimed to quantify the effects of long-chain polyunsaturated omega-3 fatty acid enriched supplements on the wool quality, digestibility, plasma metabolites, growth and body conformation of genetically divergent prime lambs sired by Dorset, White Suffolk and Merino rams under identical management conditions.

Experimental Design:

A 9 week supplementary indoor feeding trial using metabolic crates to house 24 lambs of first cross Merino progeny sired by Merino, Dorset and White Suffolk rams was completed. Three omega-3 treatments were used including a control, medium and high supplementary feeding level. Lambs were arranged in a completely randomized design, balanced by sire breed and sex. A basal diet of unrestricted lucerne hay and water, with a three-week adjustment period was included. Dry matter intakes were recorded daily and wool was collected at the beginning and end of the experiment and tested at the Australian Wool Testing Authority. Weekly measurements of body conformation and liveweight traits were also taken.

Key Outcomes:

Wool Quality: It was found that omega-3 supplementation induced no significant change in the measured attributes of wool quality in genetically divergent prime lambs. Wool quality measurements included mean fibre diameter (MFD), coefficient of variation, standard deviation, comfort factor, curvature, yield and colour (brightness and yellowness). This contributes to establishing the wool quality knowledge gap and indicates that genes regulating wool quality are seemingly unaffected by time-limited dietary provisions of omega-3 fatty acids. Expected sire breed differences were detected, with the finest quality wool seen in the superfine Merinos, followed by the White Suffolks, while Dorset sired progeny were the broadest. The Merinos also showed significant improvement in MFD and wool yield throughout the experiment, compared to White Suffolk and Dorset sired lambs. Beneficial properties of the isoenergetic feed supplement provided for Merinos, were also shown through omega-3 interactions with wool brightness. The medium omega-3 supplemented Merinos showed the most promising results for wool brightness index. This reflected variable nutrient partitioning between sire breeds and the influence of the maternal Merino in wool growth of first cross

lambs. It is also indicative of the expected increased wool variability seen with paternal sire breed genetics. Small variations in wool quality with sex were most likely associated with hormonal variation affecting nutrient partitioning pathways.

Growth Performance: Liveweight, body conformation parameters (chest girth, withers height, body length) and feed conversion ratio (feed consumed/weight gained) were not significantly affected by canola-oil based omega-3 supplementation. No differences were detected between the sexes; while increased withers height growth in White Suffolk was the only effect observed between sire breeds. Regression analysis of residual feed intake showed liveweight predictability was weak, though strongly significant. Substantial improvement in predictability was achieved when separated between sire breeds.

Dry Matter Intake & Digestibility: Regardless of the presence of omega-3 in the experimental diets, it was discerned that dry matter intakes and digestibility did not significantly differ. Dry matter intakes also did not differ between sire breeds, or sex, which was reflective of the diets being homogenous for energy content, acid detergent fibre and neutral detergent fibre. It also further highlighted the impact of the maternal Merino genetics in suppressing sire breed feed efficiency differences, that may be otherwise detected in a purebred scenario.

Plasma Metabolites: Plasma metabolite analysis further exemplified wool and growth performance changes, with no negative implications associated with omega-3 supplementation identified. Increased cholesterol detected in omega-3 supplemented lambs, was inside the expected range for healthy development and indicative of the enhanced deposition of fatty acids in muscle fractions.

Summary:

The absence of effects associated with omega-3 supplementation emphasises the capacity for producers to supplement both purebred Merino and dual-purpose terminally sired first cross Merino lambs, without deleterious consequences on either wool or fat-lamb income streams. This is especially important, with an increasing consumer desire for beneficial health properties within their meat products. Importantly, outcomes of this research indicate that dual purpose breeders can supplement omega-3 without detrimental growth, digestibility, plasma metabolite, or wool production impacts. Future studies incorporating extended trials would enable the analysis of non-measurable wool traits from this study, including clean fleece weight, staple strength and staple length. Additionally, field based omega-3 supplementation trials would yield important knowledge for how wool quality traits respond to environmental conditions. With continued research, this represents an exciting future pathway for dual purpose supplementation programs.