Summary Report for AWET Undergraduate Project Scholarship

Ruminant neonates are born agammaglobulinaemic, as no antibodies from the dam are transferred to the foetus via the placenta. Therefore, they are entirely dependent on gaining passive immunity from their mother after birth through the ingestion of colostrum. The colostrum immunoglobulins, especially IgG, in conjunction with the ability of the neonatal gut to allow unrestricted passage of the large immunoglobulin molecules, provide the newborn with passive immunity.

Previously, a number of studies have been undertaken analysing the effects that diet and breed have on bovine colostrum quality and the transfer of passive immunity in calves. However, there has been limited research on these effects in sheep. Thus the major aim of this study was to examine breed and diet effects on ewe immune status and colostrum quality, and the birth weight and/or the transfer of passive immunity in their lambs. From this it would be possible to determine if relationships exist between (1) the immune status (serum IgG concentration) of the ewe in late gestation and the quality of the colostrum she subsequently produces; and (2) the quality of colostrum consumed by lambs and their subsequent immune status. Both male and female lambs and singles and twins were sampled in this study to see if sex or birth type influenced the birth weight and the immune status of lambs. In addition, the effect of lamb birth weight on the immune status of lambs, and if either lamb birth weight or their immune status affected their survival was investigated.

The following study involved Merino and Dorper ewes grazing dual-purpose wheat and canola in late gestation. The experimental design was a 2 x 2 factorial treatment structure, with two treatments and three replicates. A total of 24 pregnant ewes, 12 Merino and 12 Dorper, were randomly selected from a mob of 142 pregnant ewes, involved in a larger MLA trial. The main focus of this study was determination of the concentration of the immunoglobulin G (IgG) in ewe serum, colostrum and lamb serum, 24 h post-partum. Blood samples were taken from the jugular vein of the ewes and lambs, and ewes were hand-milked to collect a minimum of 5 mL of colostrum, 24 h after birth. The IgG concentrations of the ewe and lamb samples were quantified using a commercially available ovine ELISA assay.

Measurement of IgG concentrations by ELISA revealed there were no significant ($P > 0.05$) breed differences between Merino and Dorper ewes for the concentration of IgG in their serum and colostrum. The diet, dual-purpose wheat or canola that the ewes grazed also did not significantly ($P > 0.05$) influence ewe immune status or colostrum quality, 24 h post-partum. The colostral IgG concentration was not associated ($P > 0.05$) with serum IgG concentrations in both ewes and lambs. This suggests that the immune status of ewes cannot be used to predict the quality of colostrum they will produce and therefore the immune status of their lambs. The serum IgG concentration of ewes was significantly ($P < 0.05$) associated with their live weight and body condition score one week pre-partum, although their colostral IgG concentration was not ($P > 0.05$). The breed genotype of ewes and the diet they grazed during late gestation did not affect ($P > 0.05$) the concentration of IgG in their lamb's serum or their birthweight. When fitted to a linear model, the interaction term of colostral IgG concentration modified by lamb birthweight did significantly affect ($P < 0.05$) lamb serum IgG concentration. Birth type significantly ($P < 0.05$) affected the birthweight of lambs, and single lambs (5.61 ± 0.306 kg) were significantly heavier than that of twin lambs (4.86 ± 0.139 kg). There was a highly significant ($P < 0.01$) relationship between lamb serum IgG concentration 24 h post-partum and their survival pre-weaning.

The results suggested that grazing Merino and Dorper ewes on dual-purpose wheat and canola during late gestation does not affect their serum IgG or colostral IgG concentrations 24 h after lamb birth. Also, the immune status of lambs was not influenced by ewe breed, the diet ewes consumed, colostrum quality, birth type, sex or birthweight. However, the immune status of lambs can be influenced by the quality of colostrum they consumed modified by their birthweight. Also, depending on whether lambs are born as a singleton or twin, their birthweight will either be heavier or lighter, respectively. Finally, lamb serum IgG concentrations > 6.96 mg/mL are beneficial to lamb survival in the pre-weaning period. Further research is needed to confirm the effect of different diets of varying qualities and types and different sheep breeds have on the immune status of ewes and the quality of colostrum they produce and the immune status of lambs and their birthweight. More studies are also needed to identify the key factors that affect the transfer of passive immunity in lambs and why there is such variability in their immune status 24 h post-partum.

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