

## IgE and interleukin-5 production and faecal dry matter in parasite-resistant Australian sheep

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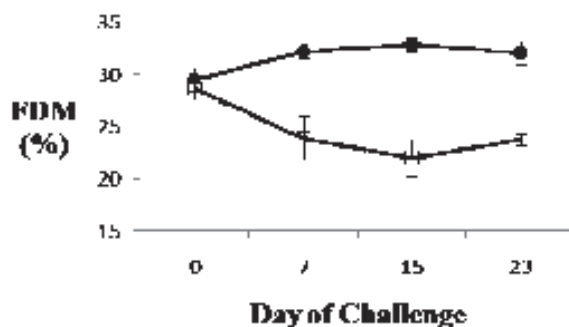
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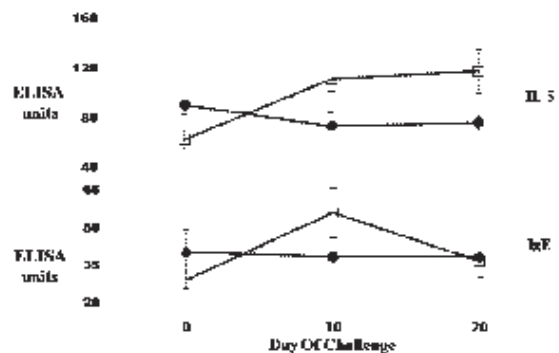
**Introduction** Scouring (diarrhoea) is a major problem for sheep producers as it leads to a build up of faecal material on the wool around the breech (dags), predisposing the animal to flystrike. Scouring occurs when the consistency of faeces is fluid with a low percentage of dry matter, and is associated with ingestion of parasitic nematode larvae such as *Trichostrongylus colubriformis*. We have previously shown that challenging parasite-resistant sheep with nematode larvae results in a reduction in faecal dry matter despite very few worms establishing (Williams *et al.*, 2009). This suggests that some component of the immune response is responsible for scouring in resistant animals. In this experiment we investigated two such components, *T. colubriformis*-specific IgE and the cytokine interleukin-5 which is largely responsible for proliferation of inflammatory cells such as eosinophils. We hypothesised that IgE and IL-5 in serum would be increased when resistant sheep were challenged with *T. colubriformis* larvae and this would be accompanied by a reduction in faecal dry matter.

**Materials and methods** The sheep used in this study were from a parasite-resistant Merino line owned by the Department of Agriculture and Food Western Australia. Sheep from this line are selected for parasite resistance on the basis of low faecal egg counts (FEC) following a natural parasite challenge. FEC and dag scores are regularly monitored on all sheep in this flock. Ten 2-year old rams were selected that all had low FEC but high dag scores in the field. These were then treated with anthelmintic and housed indoors. 5 rams were then dosed daily for three weeks with 1000 *T. colubriformis* larvae. 5 rams were unchallenged controls. Each week, at least ten grams of faeces was collected from each sheep, weighed and then dried in an oven at 90°C to determine the percentage of faecal dry matter (FDM). Serum was collected from all rams before challenge commenced and then at 10 and 20 days after *T. colubriformis* specific-IgE was measured using a sandwich ELISA. IL-5 was measured according to the method of Doligowska *et al.* (1999). Results were expressed in ELISA units, where 100 units represented the absorbance at 412 nm of a positive control standard (high-reading sera) run on every plate. Differences in FDM, IgE and IL-5 between challenged and control sheep over the course of the experiment were determined using a mixed model analysis in SAS version 9.1 with group and week as fixed factors.

**Results** 7 days after challenge commenced FDM was reduced in the challenged sheep compared to the pre-challenge period and was also lower than in the control sheep ( $P < 0.01$ ). At 14 and 21 days after challenge FDM in the challenged sheep did not differ from day 7 but remained lower ( $P < 0.01$ ) than in the control sheep (Figure 1). IgE increased ( $P < 0.05$ ) in the challenged sheep ten days after challenge commenced but fell to baseline levels by day 20 (Figure 2). IL-5 also increased ( $P < 0.05$ ) in the challenged sheep at 10 days after challenge commenced but did not increase further at day 20. IL-5 tended to decrease in the control sheep (Figure 2).



**Figure 1** FDM (means  $\pm$  sem) in control (●) and challenged (□) rams during larval challenge



**Figure 2** IL-5 and IgE concentrations in serum (means  $\pm$  sem) in control (●) and challenged (□) rams during larval challenge

**Conclusions** Some sheep that are resistant to parasites may scour as a result of the immune response to newly ingested larvae. IgE and IL-5 were increased during larval challenge which may indicate a role in this immunity, although serum levels may not fully indicate the role that they play at the gut mucosal level. It is of interest to note from these results that the marked reduction in FDM in the challenged sheep occurred within 7 days which tends to coincide with the peak in IgE and IL-5 production we observed. Therefore, it could be tentatively postulated that these mechanisms may be responsible for some of the scouring seen in resistant sheep. IgE may be responsible for releasing mast cell-derived mediators such as histamine that contribute to diarrhoea, even after the initial increase in IgE has returned to baseline levels.

**Acknowledgements** We are very grateful to Phil Stein, Novartis Animal Health Australia, for supplying the infective larvae and to Susan McClure, CSIRO Livestock Industries, Armidale, Australia for the ovine IgE monoclonal antibody.

### References

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