

## Gastrointestinal nematode resistance in Scottish Blackface lambs

Gastrointestinal nematode (GIN) parasitism is a major constraint affecting sheep production systems. Naive lambs are exposed to infection when grazing contaminated pasture and current control is based on frequent treatment with anthelmintic products. However, the looming spectre of widespread anthelmintic resistance has led to interest in alternative nematode control strategies such as breeding for resistance. This strategy would be aided by an understanding of the molecular mechanism of GIN resistance in lambs.



The objectives of this study were to identify Scottish Blackface lambs that differed in their resistance to gastrointestinal nematode infection, characterise the host response to infection in resistant and susceptible lambs and identify genes and biological processes important for the difference in resistance status.

An animal selection model was developed that reliably identified Scottish Blackface lambs that differed in resistance to GIN. After a controlled challenge with *Teladorsagia circumcincta*, resistant animals displayed consistently lower faecal egg count (FEC) throughout the course of infection. This was largely a result of worm fecundity differences, with resistant animals containing shorter, less fecund adult females. There was also a significant correlation between the number of adult worms and FEC at slaughter. The anti-nematode response was mediated, at least in part, by IgA, with resistant animals having significantly higher levels of serum anti-nematode IgA throughout the infection and higher mucosal anti-nematode IgA at slaughter. Taken together, these results indicate lower FEC in resistant Scottish Blackface lambs is primarily a result of reduced worm fecundity, although lower adult worm burden may also play a role.

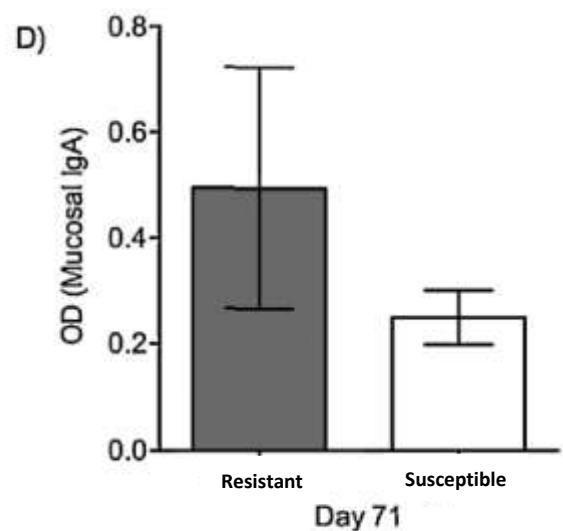
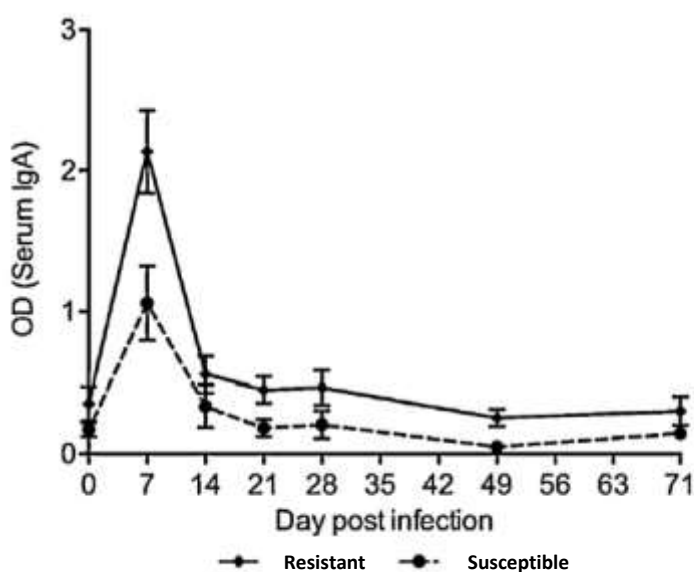


Fig. 1. Resistant lambs generate a higher anti-nematode IgA immune response in serum and at the site of infection.

Gene expression in the abomasal lymph node was examined at 7 and 14 days post infection (dpi) in resistant and susceptible lambs. A total of 194 and 144 genes were differentially expressed between resistant and susceptible lambs at 7 and 14 dpi respectively. At 7 dpi pathways relating to the inflammatory response, migration of T lymphocytes and synthesis of reactive oxygen species were more highly expressed in resistant animals. In their susceptible counterparts this immune response was delayed until 14 dpi indicating that resistant animals are generating an earlier immune response to *T. circumcincta*. Association testing in the Scottish Blackface population was carried out using 932 SNP markers in 8 genomic regions. A number of suggestive associations with FEC were observed, however none were significant at the genome-wide level. The results from this study support the use of a panel of SNPs rather than individual SNPs for predicting nematode resistance, in agreement with the complexity of this polygenic trait.

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### **Further reading**

McRae KM, Good B, Hanrahan JP, McCabe MS, Cormican P, Sweeney T, O'Connell MJ, Keane OM. Transcriptional profiling of the ovine abomasal lymph node reveals a role for timing of the immune response in gastrointestinal nematode resistance. *Vet Parasitol.* 2016. 224:96-108.

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