DETERMINING THE RELATIONSHIP BETWEEN SHEEP TEMPERAMENT AND RESISTANCE TO WORMS

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SUMMARY

The Rylington Merino flock, containing a low faecal worm egg count (FWEC) selection line and an unselected control line was used in this experiment. Differences (P=0.07) were found between the selected and control line for temperament in the Box test but not in the Scales or Score test. The low FWEC line sheep tended to have a quieter temperament than the control line. Higher body weights were associated with better temperament with the Scales test but the reverse was found for the Box test.

Keywords: Merino sheep, temperament, behaviour, worms, resistance

INTRODUCTION

Research has shown that there are extensive and complex interactions between the immune and nervous systems. The final expression of any immune system response is determined not only by the regulatory mechanisms within the immune system but also by the interactions between the immune, nervous and endocrine systems (Gauci *et al.* 1992). Limited work has been undertaken to determine if there is a relationship between temperament and parasite immunity (Burrow 1997).

Sustainable worm control in sheep will require a greater emphasis on breeding for increased host resistance (Karlsson and Greeff 1997). Quiet temperament in farm animals has many benefits ranging from practical husbandry aspects to less stress-induced immunosuppression. The aim of this study was to determine if there is a relationship between sheep temperament and resistance to internal parasites.

MATERIALS AND METHODOLOGY

A flock of 181 sheep (147 ewes and 34 rams) at 2 years of age were sourced from the Rylington Merino flock (Boyup Brook, Western Australia). This flock contains a line that has been selected for worm resistance on the basis of low FWEC and an unselected control line. The trial was based on a randomised block design as described by Anderson *et al* (1994).

Sheep temperament measurements were carried out using 3 different tests. A shearing shed was used to minimise external factors. All animals were brought into the shearing shed and penned in groups of approximately 15, ewes were kept separate from the rams. Pens of animals were put into a race which enabled them to walk firstly to the Scales test, then the Score test and lastly to the Box test, in that order.

Scales Test. The Scales test involved walking each sheep into the suspended metal crate of the weighing scales on which an electronic agitation meter was attached. The meter measured animal movements, high pitched bleats and vibrations and expressed the degree of agitation of the animal. At the beginning of the experimental procedure, the meter was calibrated with a second meter used for the Box test. In the weighing crate each sheep had its identity, horn status and weight recorded before the meter was turned on for 1 min, during which time it recorded the cumulative numeric response of the animal. As soon as the 1 min had elapsed the meter was turned off, and the animal released into a rest area where the Score test was undertaken. The suspension Scale test with electronic recording was tried to achieve a relatively simple combination of weighing and measurement of behaviour in a practical way.

Score Test. The Score test comprised an area of 1.5 m x 1.5 m in which the animal rested for 30 s after the Scales test. During this time, subjective measurements were made on a scale of 1 to 5 as follows: 1 – very little movement within the enclosure, placid and relaxed; 2 – some movement, smelling its surroundings; 3 – signs of restlessness, smelling, bleating; 4 – pacing within the pen, snorting, bleating; 5 – nervous, snorting, excited, skittish, bleating, attempts to escape out of the enclosure. Once the 30 s elapsed, the animal was walked into the box (to undertake the Box test).

Box Test. The Box test, originally devised by Putu (1989) and later modified by Murphy *et al* (1994), comprised of a plywood box 1.5m^3 with a slatted floor, a lid, entry and exit door. The box was placed on 4 rubber tyres that allowed the box to move if an animal within was agitated while the second electronic calibrated agitation meter measured high pitched bleats and vibrations. As soon as the animal entered the box, the meter was turned on for 1 min duration, recording the sounds and movements in numeric values. After 1 min the meter was turned off and the animal released through the exit door of the box. It was then free to leave the shed.

STATISTICAL ANALYSIS

An analysis of variance was carried out on the temperament measurement with line, sex and horns as fixed effects. The Scales and Box test measurements were transformed to logarithms to normalise the data. Time of day and temperature were fitted as covariates but were not found to be significant ($P>0.05$) and were excluded from further analysis. Body weight was fitted within lines to determine whether body weight affects temperament and/or behaviour significantly.

RESULTS AND DISCUSSION

The mean values of body weight, Scales test, Box test and Score test are indicated in Table 1 for the control and selection line.

Table 1. Mean body weight, Scales, Score and Box test measurement of the selection and control lines

Trait	Control line Mean ± se	Selection line Mean ± se	P-value
Scales test (units)	1.84 ± 0.09	1.83 ± 0.06	0.94
Score (scale 1-5)	2.43 ± 0.21	2.09 ± 0.15	0.12
Box test (units)	1.47 ± 0.08	1.30 ± 0.06	0.07
Body weight (kg)	39.3 ± 0.66	37.4 ± 0.48	0.01

Scales Test. No significant difference (P=0.94) was found between the lines in this test. Within the lines, Poll rams from the control line had a significantly (P<0.05) quieter temperament than the other five treatment combinations. This indicates that the crate used in this experiment was not suitable for horned rams as it amplifies any head movement. Evaluation of other weighing crates would be warranted. The results also indicate that bigger sheep appear to have a quieter temperament than smaller sheep (P=0.07). This was more apparent in the control line than the selection line and disagrees with the results of Hassall (1974) and Murphy (pers. comm.). A possible explanation could be that the limited space in the weighing crate might have restricted the bigger sheep to move.

Score Test. The low FWEC line tended to be quieter than their contemporaries in the control line, although the difference was not significant (P=0.12). No significant differences were found between sex or horn status within lines. Body weight did not affect this trait significantly. There is obviously considerable scope to vary the conditions in the subjective visual scoring tests such as the method used in this experiment or others such as the arena test (Hohenhaus *et al.* 1998) with the aim of achieving maximum differentiation for behaviour.

Box Test. The low FWEC line had a lower (P=0.07) agitation reading in this test. However, body weight affected this test in that smaller animals had a better temperament (P=0.08) than bigger sheep. This supports the work of Hassall (1974) and Murphy (pers. comm.). Ewes had a higher reading than the rams in this test but this was not significant (P>0.05).

Correlations Between Tests. Correlations between the three temperament measurements were moderate to low between the; scales and score test (r=0.48) (P<0.001); scales and box test (r=0.218) (P<0.01); and score and the box test (r=0.157) (P<0.05). This is lower than the correlation's reported by Putu (1989) and Murphy *et al* (1994) and suggests that these different tests may measure different components of the composite behavioural trait. This trait could be further differentiated into behaviour such as vocalisation, fidgeting, feet stamping and bleating. It may also reflect subtle differences in the physical environment during the test procedure.

CONCLUSION

An enhanced immune response and quiet temperament are both desirable traits in their own right. The tendency of the selection line to have a better temperament than the control line in the Score and Box test agrees with the expectation that quieter animals are less prone to stress and therefore less prone to a stress induced suppression of the acquired immune response. As the control group in this study was relatively small, this study should be repeated with greater numbers.

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