AN APPROACH FOR THE IDENTIFICATION AND EVALUATION OF INDIRECT SELECTION CRITERIA FOR FLEECE-ROT SUSCEPTIBILITY

H. W. Raadsma and I. M. Rogan

Agricultural Research Centre, PMB 19, Trangie, New South Wales 2823

In evaluating potential indirect selection criteria for use in breeding programs that aim at reducing the susceptibility of Merino sheep to fleece-rot and body strike, an accurate estimate is needed of the genetic parameters involved. There is a particular interest in estimating the heritability of traits and genetic correlations with fleece-rot susceptibility. This evaluation is often costly and time-consuming and a lot of characters may need to be screened before a suitable character can be identified which meets all the requirements as an indirect selection criterion.

Several short-cut approaches can be adopted to estimate the association between potential indirect selection criteria and fleece-rot susceptibility. These involve:

A. **Comparison of Skin and Wool Characters Between Flocks Varying in Fleece-Rot Susceptibility**

This may take two forms:

(i) *Contemporaneous comparisons between randomly bred animals representing different breeds, strains, and flocks within strains*
Large differences in fleece-rot susceptibility have been observed between strains and bloodlines within the Merino breed. These differences have been shown to be relatively highly correlated with variation between the strains and bloodlines in some skin and wool characters (for example, −0.43 for wettability and fleece-rot incidence). However, the usefulness of these between-flock correlations in indicating possible indirect selection criteria must be questioned, when one considers their apparently poor relationship with within-flock phenotypic correlations for the same sets of characters (for example, 0.00 for wettability and fleece-rot incidence). It is therefore unlikely that this approach will provide accurate estimates of the genetic correlations needed.

(ii) *Comparison between flocks which have been taken from the same base population but which have been selected for and against susceptibility to fleece-rot*
This allows for indirect changes in skin and wool characters to be monitored, provided that sufficient genetic progress has been made in the selected trait. Using this approach, realised genetic correlations between skin and wool characters and fleece-rot can be estimated. It offers the best approach for demonstrating genetic correlations as well as identifying new skin and wool characters associated with fleece-rot.

B. **Comparison of Skin and Wool Characters Between Resistant and Susceptible Animals Within a Flock**

Studies utilising this approach have either classed animals on the basis of the presence or absence of fleece-rot after predisposing conditions or classed the animals on a subjective basis without the presence of fleece-rot. Unless all the animals have been sampled before the fleece-rot challenge and the animals from the whole population are used for the estimation of the phenotypic correlation, this approach is of limited value. However, an estimate

of the phenotypic correlation between these skin and wool characters and fleece-rot could be used as a short-cut indication of the magnitude of the genetic correlation.

C. Measurement of Fleece-Rot Susceptibility of Flocks Selected for Increased and Decreased Performance in Characters of Economic Importance

This allows a relatively fast estimate of the realised genetic correlation between fleece-rot and the limited number of economically important characters for which selection flocks are available. However, it is unlikely that characters of economic importance would be good indicators of an animal's resistance to fleece-rot and it limits the identification of new characters directly associated with fleece-rot resistance.

D. Systematic Experimental Approach to Identify the Main Mechanisms Involved in Fleece-Rot Development and Resistance

Most characters that are being evaluated as indirect selection criteria to date have been identified following speculation that they could be in some way responsible for fleece-rot resistance. However, little is known about the main factors responsible for fleece-rot resistance in sheep. An examination of the relative importance of the three barriers (the fleece; fleece/skin interface; skin/immunological system) that are thought to be responsible for fleece-rot resistance is urgently needed. Only when the main barrier responsible for fleece-rot resistance has been identified can the main factors contributing to that barrier be identified and evaluated as indirect selection criteria.

Most of the approaches mentioned above have been adopted in the Trangie research program, which aims at identifying and evaluating new indirect criteria for fleece-rot susceptibility.

For final evaluation of the suitability of a promising character as an indirect selection criterion we aim at measuring 1500 offspring, representing random-bred 135-150 sires. The appropriate genetic parameters can be adequately measured within a three-year program.