GENETIC RESISTANCE TO GASTROINTESTINAL ENDOPARASITES IN DIFFERENT GENETIC GROUPS OF SHEEP

L.M. Nieto, E.N. Martins, F.A.F. Macedo, E.S. Sakaguti and A.I. Santos

Departamento de Zootecnia, Universidade estadual de Maringá, Av. Colombo 5790, CEP 87020-900, Maringá, Brasil

INTRODUCTION

The gastrointestinal endoparasites are one of the great sanitary problems in sheep production in Brazil. Economical losses caused by decrease in the production, increase in prophylaxis costs, as well as increase in the tax of mortality of the animals are influenced seriously by gastrointestinal endoparasites.

Traditionally, the control of these endoparasites are based on exclusive use of anthelminthic or associate to management of pastures. Although this practice has been efficient in the control of parasitism, it caused the appearance of anthelminthic resistance. Results of several researches indicate the need of alternative strategies of control of infections by endoparasites to be developed. One of the proposals is to develop animals genetically resistant to infection by gastrointestinal endoparasites and their effects. This would contribute so much to reduce the contamination of the pastures, as to reduce the anthelminthic treatment number, delaying the resistance development and reducing the production costs.

The objective of this work was to obtain variance components for sheep resistance to the infection by gastrointestinal endoparasites under conditions of natural infection.

MATERIAL AND METHODS

The experiment was carried out in the Research Center of Arenito, of the Universidade Estadual de Maringá, in the municipal district of Cidade Gaúcha, Northwest of Paraná, Brazil. This area locates to 23'' 25' of South latitude, 51'' 55' of longitude West. The information of number of eggs per gram of feces (EPG) were obtained by modified McMaster techniques of 95 crossed sheep from Corriedale dams and Bergamasca and Hampshire Down rams from July 1998 to August 2000.

The counting of EPG was carried out each 28 days and whenever it went superior to 500, the animal was drenched and it stayed in facilities of floor suspended for 48 hours. After the counting of EPG the animals were transferred for new paddock.

The sheep were divided in three groups, being each group raised exclusively 1 ha paddock with *Panicum maximun* Jacq, *Cynodon dactylon* or *Paspalum notatum* Flueeg.

EPG of 163 offspring from crosses involving Texel males and crosses females were also used. Every 28 days, starting from the day of entrance in the paddock, the lambs were weighted, submitted individually to the counting of EPG, being drenched when the result was larger than 500. The information of logEPG counting, considered as measures of the resistance of the animals, and information of daily weight gain (DWG) were analyzed through the software MTGSAM - Multiple Trait Gibbs Sampling Animal in Model developed by van Tassel and van Vleck (1996).

For the fixed effects was assumed flat prior distribution. For the components of genetic (co)variance, permanent environmental effect and residual, was admitted that the additive (co)variance genetic matrix, the variance and (co)variance of permanent environmental effect matrix and variance and covariance residual matrix among the characteristics had distribution of Inverted Wishart (IW).
For the analysis of characteristics an multitrait analyses was proposed, being used an animal model that includes the fixed effects of contemporary group (CG) and year and random direct effects of the animal and the environmental permanent effect. CG were constituted by animals (of the same category, of the same sex, submitted to the same treatment). For each analysis, chains of Gibbs of 1 000 000 cycles were generated and samples were removed to each 1 000 cycles, after the elimination of the 100 000 initial cycles.

RESULTS AND DISCUSSION
The heritability of the logEPG was of 0.18 (table 1). This result is below to that obtained in New Zealand by Bisset *et al*. (1992) that estimed heritability, in Romney sheep of 0.34. In animals of the same race, Douch *et al*. (1995) moderated medium heritability of 0.23 for two date from sampling. In Australia, Eady *et al*. (1996), working with lines of Merino sheep, which were tested for resistance the endoparasites, estimed heritability between 0.07 and 0.42 from different lines. Rege *et al*. (1996), in Ethiopia, evaluating the resistance of Menz and Horro sheep, founded heritability of 0.34. In Poland, Bouix *et al*. (1998) estimed, in the race Polish long-wool, heritability between 0.20 and 0.33, depending on the month of collection of EPG.

Table 1. Genetics parameters for logEPG, daily weight gain (DWG) and packed cell volume (PVC) (heritabilities in diagonal, genetic correlation below diagonal and phenotypic correlation above diagonal)

	$log_{10}EPG$	*DGW*
$log_{10}EPG$	**0.18**	-0.02
DWG	0.48	**0.00**

In table 2, the credibility intervals are presented to the level of 95 % for the additive genetic, residual, and permanent environmental variance and heritability for logEPG.
The heritability estimated for daily weight gain was of 0.0041 (table 1) with interval of credibility of 95 % between 0.0008 and 0.1718 (table 2). This estimate is below the one reported by Bouix *et al*. (1998), who obtained heritability of 0.31 for growth of the lambs of the race Polish long-wool, but, is similar to that founded in Africa, for lambs of the race Menz and Horro, by Rege *et al*. (1996), and moderated by Eady *et al*. (1998), for Merino sheep, who found an estimate no different from zero.
The genetic correlation, between logEPG and WDG of the lambs, was unfavorable (table 1). This result is not similar to the null genetic correlation found by Rodriguez-zas *et al*. (1999), in pure lambs, of the races Doper and Red Massai, as in the crossbreeds, and the estimates, almost nulls, of –0.01 and –0.09, obtained by Bisset *et al*. (1992) and by Douch *et al*. (1995),

respectively, in Romney sheep. The phenotypic correlation between EPG and WDG, was almost null (-0.02), which indicated that the heaviest animals were not necessarily the most resistant.

Table 2. Estimates of variance component and heritability, credibility intervals at 95 % level and the high density regions of posterior distribution of logEPG, daily weight gain (DWG) and packed volume cell (PVC)

Trait	Genetic parameter	Estimate	Credibility intervals
logEPG	σ_a^2	0.0804	0.0582 | — | 0.1106
	σ_p^2	0.0134	0.0074 | — | 0.0222
	σ_r^2	0.3411	0.3196 | — | 0.3655
	h^2	0.1840	0.1392 | — | 0.2411
DGW	σ_a^2	0.0837	0.0184 | — | 0.3383
	σ_p^2	0.0527	0.0075 | — | 0.2950
	σ_r^2	20.2278	16.9432 | — | 24.2139
	h^2	0.0041	0.0008 | — | 0.17184

σ_a^2 = additive genetic variance, σ_p^2 = permanent environmental variance, σ_r^2 =residual variance, h^2 = heritability.

CONCLUSION

The results show that selection leading in decreased counting of EPG, is possible, however it can affect the growth of the animals.

REFERENCES

Bisset, S.A., Vlassoff, A. and Morris, C.A. (1992) *New Zealand J. Agric. Res*. **35** : 51-58.

Bouix, J., Krupinski, J., Rzepecki, R., Nowosad, B., Skrzyzala, I., Roborzynski, M., Fudalewicz, Niemczyck, Skalska, M., Malczewski, A. and Gruner, L. (1998) *Int. J. for Paras*. **28** : 1797-1804.

Douch, G.C., Green, R.S., Morris, C.A., Bisset, S.A., Vlassoff, A., Baker, R.L., Watson, T.G., Hurford, A.P. and Wheeler, M. (1995) *Livest. Prod. Sci*. **41** : 121-132.

Eady, S.J., Woolaston, R.R., Lewer, R.P., Raadsma, H.W., Swan, A.A. and Ponzoni, R.W. (1998) *Aust. J. Agric. Res*. **49** : 1201-1211.

Eady, S.J., Woolaston, R.R. and Mortimer, S.I. (1996) *Aust. J. Agric. Res*. **47** : 895-915.

Rege, J.E.O., Tembely, S., Mukasa, E., Sovani, E.O., Anindo, D., Lahlou-Kassi, A. and Baker, R.L. (1996) *Proc. 3th BCASRN* Nairobi : 37-46.

Rodriguez-zas, S.L., Southey, B.R., Baker, R.L. and Ginanola, D. (1999) *J. Anim. Sci*. **77** (suppl. 1) : 32.

Van Tassel, C.P. and Van Vleck, L.D. (1996) *J. Anim. Sci*. **74** : 2586-2597.