Genetic Parameters Of A Gastrointestinal Resistance Trait In Creole Goats During Post-Weaning Period Using A Random Regression Model

C. de la Chevrotière[*], M. Gunia[*], A. Menendez-Buxadera [†], J.C. Bambou[*], N. Mandonnet[*]

Introduction

Infections by gastrointestinal nematodes are responsible of major loss of production in the Creole goat raised for meat in Guadeloupe (Mandonnet *et al.,* 2003). Resistance is under genetic control in this population, thus providing an alternative to the systematic use of anthelmintics (Mandonnet *et al.,* 2001). The random regression methodology (Schaeffer and Dekkers, 1994) was used to estimate genetic parameters of the faecal egg counts (FEC), a resistance trait, in order to analyse its evolution through the post-weaning period.

Material and methods

Data. Data used in this study were obtained from the an experimental flock of Creole goats raised at pasture under a natural mixed nematode infection, mainly composed by *Haemonchus contortus*, *Trichostrongylus colubriformis* and *Oesophagostomum columbianum*. FEC were collected on each animal every 7 weeks after drenching with levamisole, during the post-weaning period (3 to 11 months of age). A total of 4225 records from 2350 animals were analyzed with a random regression model using the Asreml software (Gilmour et al., 2002). A longitudinal file was made in which each animal is repeatedly represented for each FEC recorded.

Statistical analyses. Prior to analysis, FEC was log-transformed (LFEC=ln(FEC+15)) in order to normalize the distribution. An univariate random regression model was used and it comprised a fixed part and random terms due to the direct animal effect and the permanent individual environmental effect. Maternal effects were not significant. Fixed effects were identified using the GLM procedure of SAS software (2000). The interaction of birth rank and litter size at birth and during lactating was found significant for LFEC, as well as sex effect. A combined effect of cohort and date of measurement of traits was created and founded significant. A second order orthogonal polynomial was chosen for the fixed part of the model and for the individual permanent environmental effect. A first order was chosen for the animal effect. Variance components were estimated for week 19 to 51 for LFEC. Genetic correlations between different measurements of LFEC were also estimated.

[*] INRA Antilles-Guyane, Unité de Recherches Zootechniques, 97170 Petit-Bourg, F.W.I.
[†] Centro de Control Pecuario. c-Dirección de Genética. Ministerio de la Agricultura, Conill y Boyeros C. de la Habana, Cuba.

Results and discussion

Variance components estimated through the age scale for LFEC are shown in figure 1. Genetic variance increases with age, in concordance with previous results that shown a maximum of genetic control for nematode resistance at 11 months of age for Creole goats (de la Chevrotière, 2007).

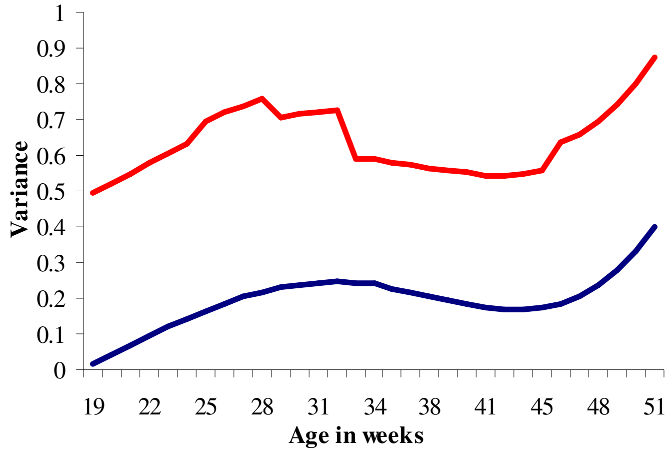

Figure 1: Genetic (blue line) and phenotypic variance (red line) for LFEC during the post-weaning period

The evolution of heritability (Figure 2) with age confirmed also this trend (0.13 at 51 weeks). In perspective of a breeding program based entirely or partially on the nematode resistance estimated with the faecal egg counts, these results indicated that measurement at 11 months is more suitable for this objective.

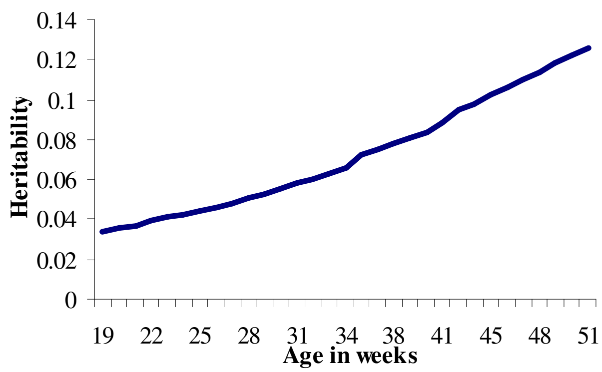

Figure 2. Heritability of LFEC during the post-weaning period.

The genetic correlation between different measurements of FEC is shown in figure 3. Nematode resistance is known to be acquired through out the age of the animal in small ruminants (Peña *et al.,* 2006). The high genetic correlation between two FEC recorded at 51 weeks on different animals indicated that these measurements can be considered as a same trait and under control of the same pool of genes. A lower genetic correlation is obtained between FEC recorded at the beginning of the post-weaning period and FEC recorded at the end of the period. The genes implies in nematode resistance may not be fully activated after weaning but become mature with exposition of nematodes during life of animal, thus confirming the adaptative function of nematode resistance. Similar results were obtained for the same resistance trait in sheep (Vagenas *et al.,* 2007).

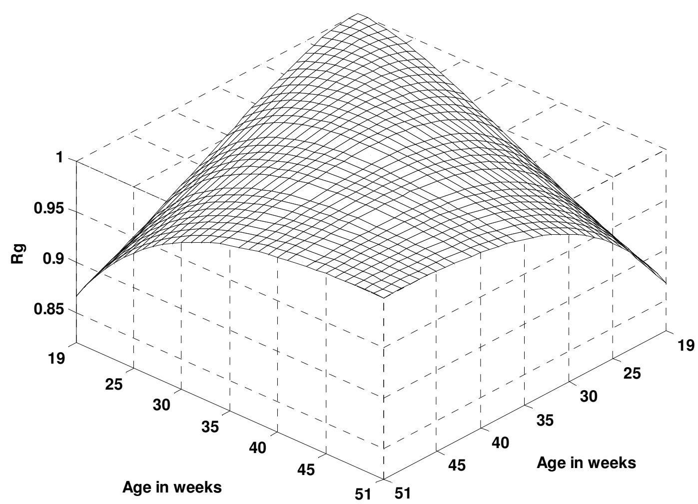

Figure 3. Genetic correlations (Rg) between FEC recorded at different age.

Conclusions

These results confirmed that FEC is under genetic control and therefore can be used in a breeding program to improve nematode resistance. Random regression analysis showed that the genetic variance and heritability increase during the post-weaning period and therefore the use of this trait at 11 months of age will be more effective in selection. This result is also supported by high genetic correlations between FEC recorded at the end of the post-weaning period thus indicating that the genes involved in the nematode resistance are the same at this age.

Acknowledgments

The authors thank the “Région Guadeloupe” for its financial support. They are grateful to the INRA teams of Gardel and parasitology laboratory.

References

de la Chevrotiere, C., (2007). *Memoire présenté à la faculté des sciences en vue de l'obtention du grade de maitre es sciences (M.Sc).* Faculté des sciences. Université de Sherbrooke.

Gilmour, A.R., Gogel, B.J., Cullis, B.R., and Thompson, R. (2006) *ASReml User Guide Release 2.0*. VSN International Ltd, Hemel Hempstead, UK.

Mandonnet, N., Aumont, G., Fleury, J., Arquet, R., Varo, H., Gruner, L., Bouix, J., and Khang, J.V.T., (2001). *J. Anim. Sci*. 79:1706-1712.

Mandonnet, N., Ducrocq, V., Arquet, R., and Aumont, G., (2003). *J. Anim. Sci*. 81:2401-2408.

Peñas, M.T., Miller, J.E., and Horohov, D.W., (2006). *Vet. Parasitol*. 138:240-246.

SAS 1999-2000. SAS Release 8.1. SAS Institute Inc., Cary, NC, USA.

Schaeffer, L.R., and Dekkers, J.C.M., (1994). *Proc 5th WCGALP*, Canada, 18:443-446.

Vagenas, D., White, I.M.S., Stear, M.J., and Bishop, S.C., (2007). *J. Agricult. Sci.*145:501-508.