

## Genetic variation in the Galway sheep breed based on microsatellite markers.

D. Howard<sup>1,2</sup>, J.P. Hanrahan<sup>1</sup> and D.E. MacHugh<sup>2</sup>

<sup>1</sup>*Teagasc, Research Centre, Athenry, Co. Galway.*

<sup>2</sup>*Department of Animal Science, Faculty of Agri-Food and the Environment, University College Dublin, Dublin 4.*

### Introduction

The Galway breed is the only native Irish sheep breed and is listed as a breed in danger of extinction. As part of the genetic conservation and overall study of the breed a DNA bank has been established. This bank is representative of the pedigree population in Ireland and will provide material for investigations on the level of genetic variation in the breed. A panel of 16 microsatellites has been selected and tested for use in the evaluation of the genetic variation in the Galway breed. This panel represents both arms of the three metacentric chromosomes and 10 other chromosomes. Linkage of the results with other studies on genetic variability was an important criterion in selecting the panel of microsatellites. The objective of this study is to describe the variability found in the breed and to compare these findings with variability studies on other sheep breeds.

### Materials and Methods

Blood samples were collected in 10-ml heparinized vacutainers from 163 pedigree Galway sheep. These animals were born in 15 different pedigree flocks and were the progeny of 44 sires. The set of sires originated from 20 different pedigree flocks. An aliquot (2 ml) of whole blood from each 10-ml sample was stored at –20°C and 180 µl was put on FTA paper (Whatmann Bioscience, Cambridge, UK). Genomic DNA from the remaining blood was extracted using a proteinase K extraction method. A subset of 94 animals was chosen for use in the present study. These represented all of the sires in the DNA bank and generally only one offspring per dam was included. The DNA from this group has been genotyped using eight microsatellite markers out of the panel of 16. Polymerase chain reaction (PCR) was performed according to standard procedures. The PCR products were subjected to electrophoresis on an ABI3100 capillary sequencer. The resulting data on the length of PCR products were analysed using the Genemapper™ software package and genotypes were assigned to individual sheep based on this information.

The variability at each marker locus was quantified by calculating the effective number of alleles, the expected heterozygosity and the polymorphism information content (PIC) (Hartl and Clark, 1997).

### Results and Discussion

All the microsatellite loci were highly polymorphic as indicated by the number of alleles present and were reasonably consistent with results from other studies using the same microsatellites (Table 1). The results on the variability at each microsatellite locus are presented in Table 2. Available information on the effective number of alleles from other studies is included for comparison. The heterozygosity was around 60% or greater for 6 of the 8 microsatellite loci indicating considerable genetic variability. However there is an indication that the effective number of alleles is somewhat less than found in other sheep breeds

**Table 1.** Number of observed alleles in Galway sheep[ and comparison with other breeds

Marker	Galway breed	Study 1 <sup>a</sup>	Study 2 <sup>b</sup>
BM1824	6	-	5
MAF64	6	6 to 12	-
OarFCB11	7	6 to 10	11
OarFCB128	6	-	9
OarCP43	5	-	-
OarCp34	8	6 to 7	7
OarHH35	6	-	-
OarAE129	6	-	-

<sup>a</sup> Arranz et al. (2001) (6 breeds) <sup>b</sup> Diez-Tascon et al. (2000) (6 Merino strains)

### Conclusions

These preliminary results indicate that while there is considerable variability in Galway sheep it is somewhat less than for comparable loci in other breeds.

### References

- Arranz, J.J., et al. (2001). *Small Ruminant Science* 39 (2001) 3-10
- Diez-Tascon, C. et al. (2000). *Animal Genetics* 31, 243-251
- Econogene project . (2004). <http://lasig.epfl.ch/projets/econogene/publications.html>
- Hartl D.L. and Clark, A.G. (1997) Principles of Population Genetics. Sinauer Associates.

**Table 2.** Effective number of alleles, heterozygosity and polymorphism information content (PIC) for eight microsatellite loci in pedigree Galway sheep.

Marker	Chromosome	Effective no. of alleles	Gene diversity	Observed heterozygosity	PIC
BM1824	1	5.0	0.80	0.58	0.77
MAF64	1	3.2	0.68	0.64	0.63
OarFCB11	2	3.5 (4.1) <sup>a</sup>	0.81	0.59	0.79
OarFCB128	2	5.4 (5.3)	0.72	0.39	0.67
OarCP43	3	3.6	0.72	0.66	0.67
OarCP34	3	3.0 (3.7)	0.66	0.75	0.63
OarHH35	4	3.2	0.69	0.31	0.64
OarAE129	5	3.4	0.70	0.76	0.65

<sup>a</sup> Average for 6 Spanish breeds (Arranz, et al., 2001).