GM2
17
EAAP
2004

PRNP polymorphisms at codons 136, 154 and 171 in ten sheep breeds of Greece

G. Lühken[1], S. Lipsky[1], C. Ligda[2], A. Georgoudis[3] and G. Erhardt[1]
and the ECONOGENE Consortium

[1]Justus-Liebig University, Department of Animal Breeding and Genetics, Ludwigstrasse 21B, 35390 Giessen, Germany; [2]National Agricultural Research Foundation, 57001 Thessaloniki, Greece; [3]Aristotle University, Department of Animal Production, 54006 Thessaloniki, Greece

Introduction

The susceptibility to scrapie in sheep is mainly modulated by allelic variation of the three codons 136, 154 and 171 in the prion protein (PrP) gene (*PRNP*).
In many European countries the eradication of ovine scrapie is now based on the selection for the haplotype $A_{136}R_{154}R_{171}$ (ARR).
Since 1986 more than 200 sheep have been tested positive for PrP^{Sc} in Greece. The scrapie outbreaks were mainly concentrated in Northern Greece (Fig. 1, red dots).

Material and Methods

The PrP polymorphisms at codons 136, 154 and 171 have been determined in five economical important and five endangered autochthone Greek sheep breeds (Fig. 1, see pictures), sampled in the regions where these breeds typically are kept (Fig. 1, green dots). For haplotype analysis of 283 DNA samples (23 to 31 per breed), a combined PCR-RFLP method was used.

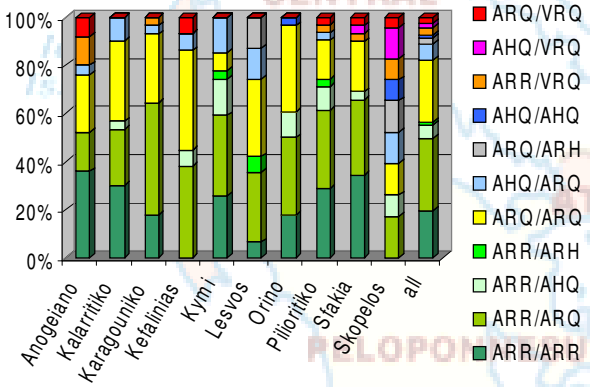

Fig. 2. Frequencies of *PRNP* genotypes in Greek sheep breeds

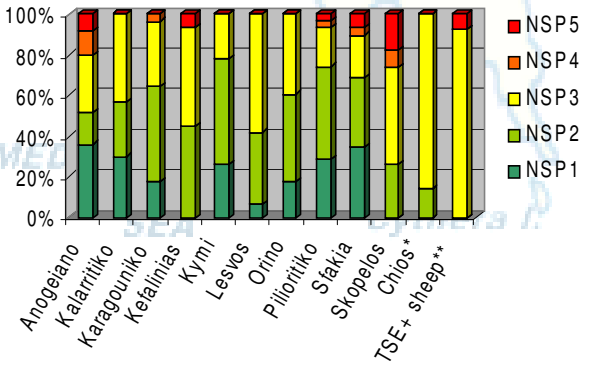

Fig. 3. Distribution of *PRNP* genotypes of Greek sheep in NSP classes

*) 120 sheep of the Chios breed, **) 121 TSE-positive Greek sheep (Billinis et al. 2004)

NSP classification system of genetical resistance or susceptibility to scrapie used in the United Kingdom:
NSP1: ARR/ARR (most resistant); NSP2: ARR/---, not VRQ (resistant);
NSP3: not ARR, not VRQ (little resistance); NSP4: ARR/VRQ (susceptible);
NSP5: VRQ/VRQ, ---/VRQ (highly susceptible)

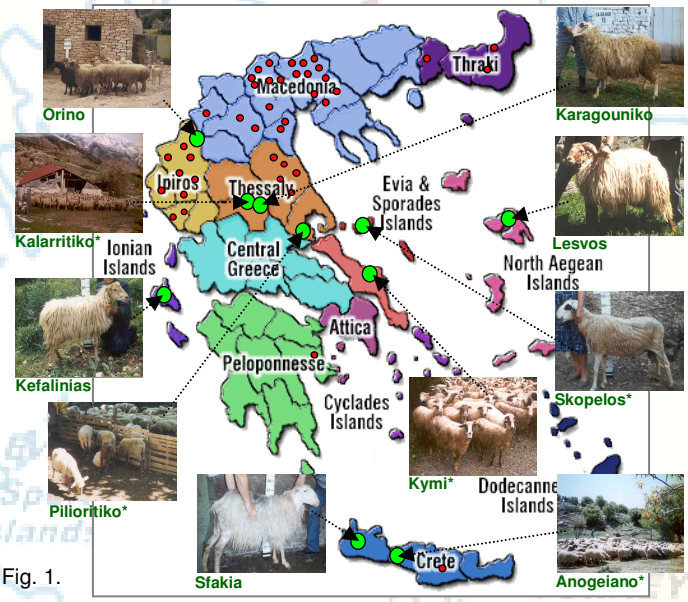

Fig. 1.
- Geographical distribution of scrapie outbreaks recorded in Greece 1986 – July 2001 (source: http://www.minagric.gr/greek/data/BSE%20Dossier-4.doc)
- Geographical location of Greek sheep breeds sampled in ECONOGENE project; *) endangered breeds

Results

PrP haplotypes

- ARR, ARQ and AHQ occured in all breeds
- ARR-frequency ranged from ± 20% (Skopelos, Kefalinias, Lesvos) and ± 40% (Orino, Karagouniko, Kalarritiko) to ± 50% (Kymi, Anogeiano, Pilioritiko, Sfakia)
- VRQ has been identified in seven breeds and ARH in five breeds

PrP genotypes (Fig. 2)

- 11 different genotypes have been observed
- between the breeds, numbers of genotypes ranged from five to nine (Skopelos)

Genetic scrapie susceptibility (Fig. 3)

- only in Kefalinias and Skopelos no ARR/ARR (=NSP1) has been found
- proportion of NSP1 plus NSP2 genotpyes was > 20% in all investigated breeds
- genotypes of NSP5 have been identified in five breeds
- proportion of NSP3 genotypes, mostly found in Greek TSE-affected sheep, ranged from 20 to 58% in the investigated breeds compared to > 85% in the Chios breed

Conclusions

- In seven of the investigated breeds, conditions for breeding to scrapie resistance are good or very good.
- Selection for ARR/ARR will be more difficult in Kefalinias and Lesvos and especially in the endangered breed Skopelos.

This work has been supported by the European Commission (ECONOGENE contract QLK5-CT-2001-02461). The content of the publication does not represent the views of the Commission or its services.