

Work Plan STSM - COST Action FA1308 DairyCare

STSM title:

Environmental adaptation of native sheep breeds in Carpathian basin

Contact person from the Host Institution:

Dr. Dinu GAVOJDIAN
Academy for Agricultural and Forestry Sciences,
Research and Development Station for Sheep
and Goats Caransebes,
Romania
Tel. (0040) – 723 375 804
E-mail: gavojdian_dinu@animalsci-tm.ro

Applicant for the STSM:

Dr. Szilvia KUSZA
University of Debrecen,
Faculty of Agricultural, Food Sciences and
Environmental Management,
Hungary
Tel. (0036) - 52508444
E-mail: kusza@agr.unideb.hu

Background:

Climatic factors like temperature and humidity have an important role in determining species distributions and they likely has effect on the phenotypic variation of populations over geographic space (Hancock et al., 2011). Correlations between phenotype and environment can be revealed by genetic polymorphisms when allele frequencies are strongly differentiated populations that live in different environments. These kind of differences can be maintained by gene flow (Coop et al., 2010; Lenomand, 2002). Many local breeds have suffered extensive population declines and are at risk now. The genetic makeup and responses to local environmental selection of local breeds are poorly understood, and may comprise genetic variants of increasing value for adaptation to future environmental change, including climate. Most of the local breeds are limited by their lack of productivity for the purposes of intensive farming. The genetic variation within native breeds may be used to enhance the currently high priority production target of sustainable intensification (Tilman et al. 2011). Their potential for high resistance to disease (Coltman et al. 2001) also merits further investigation. Large-scale studies on genetic diversity should be implemented for the Zackel and Tsigai strains located in the Carpathian basin, in order to assess their census, inbreeding rates and genetic distances among these breeds to help with the conservation efforts and avoid genetic diversity erosion or loss. A very important fact to have in mind is that in most of the 14 countries which rear Zackel and Tsigai sheep in Europe, these breeds are either listed as endangered or represent a minority breed. As such, a large scale study to investigate the molecular genetic diversity (based on mostly the polymorphisms of the heat stress genes) of the Zackel and Tsigai sheep groups (not limited to) in a regional or continental context would increase our knowledge of the development of gene pools of the European sheep breeds and sheep biodiversity and help with the FanGR conservation efforts.

Objectives:

The AIM of the current research proposal is to acquire scientific based information about the genetic characterization and make-up of the Eastern European indigenous sheep breeds and to analyze, through the use of the SNP-array (Single Nucleotide Polymorphism-array) method. I plan:

- i) to collect samples for genetic study from local sheep breeds in Romania (Turcana, Racka, Tsigai, Ruda, Karakul).
- ii) to study and evaluate the SNP (associated with heat stress, etc.HSP90AA1 promoter) variability and genetic diversity and population structure of ancient sheep breeds in Eastern European indigenous sheep breeds, with special focus on Zackel and Tsigai sheep groups;
- ii) to compare variability of heat associated SNPs among sheep breeds from Romania and literature datas from other region of Carpathian basin and Europe (different climate conditions).

Methods:

During the 2 months long (start date: 10. February, 2017.; end date: 10. April, 2017.) mission the first task will be to collect samples with Dr. Dinu Gavojdian's help, contact person from the Host Institute. An estimated number of 125 sheep (25 sample per each breed unit) will be collected, extracted DNAs and selected 90 SNPs (with a specific focus on heat tolerance, heat stress association) for the genotyping. Biological samples (hair follicles) will be taken from animals and are being managed under pedigree breeding system (with known ancestry for at least 2 generations). Sampling for the sheep will be coordinated with owners to facilitate the least possible disturbance and efficient sampling (e.g. while animals are confined for feeding, health checks, milking etc.). SNP genotyping will be subcontracted to a service company in UK (LGC) and it takes about 1.5 month, depends on the availability of the lab. Therefore within proposed STSM –besides of sample collection- laboratory work will be performed. After the applicant's return to her home institute, statistical analysis will be performed. Standard population genetic analyses will be accomplished to describe the patterns of genetic diversity, population structure (PCA, Admixture), inbreeding, and relatedness, HWE between individuals (PLINK) in each breed.

The proposed period of the mission will allow to the applicant collecting all Romanian sheep samples for the initial results of the comparative study among different sheep breeds based on SNPs of heat stress related genes variability and performing the genotyping work.

Szilvia Kusza will get chance to create foster collaboration between the University of Debrecen and Research and Development Station for Sheep and Goats, Caransebes and will ensure future cooperation. Furthermore, we plan for the results of the current work to be submitted for publication to a peer-reviewed journal, presenting acknowledgments for the FA1308 COST Action.