

STSM - COST Action FA1308 DairyCare

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STSM title: Environmental adaptation of native sheep breeds in Carpathian basin

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Aim of the Short Term Scientific Mission

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).

Scientific background of the Short Term Scientific Mission

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.

Describe of the work during the Short Term Scientific Mission

Before my STSM:

- listed and ordered chemicals, sampling and laboratory stuff for the DNA tests.

During my 2 months long mission the first task was listed the farms across Romania where Turcana, Racka, Tsigai, Ruda and Karakul sheep are reared. Then I had to contact and agree in appointment with the farmers about the date of sampling. In this part of the work, I got a huge help from Dr. Dinu Gavojdian, contact person from the Host Institute. His previous work contacts with the farmers helped my work and his continuous translation between the farmers and me avoided the language barrier too.

Altogether 200 sheep was sampled (all breeds were oversampled in order to have 25 unrelated sample per each breed unit which could be involved in the study) from different farms across Romania.

Photos are below about the sampling process of the different breeds from different farms:

Turcana



Racka



Tsigai



Karakul



Mostly hair follicles (blood in some cases) were taken from sheep. Extraction of genetical DNAs were performed using method of FAO/IAEA (2004) and stored on -20°C til the further analysis. After extraction of genomic DNAs from all studied sheep, heat tolerance, stress

associated 48 SNPs from different genes were selected mostly following recommendation of literatures (Yang et al., 2016 [Mol. Biol. Evol. 33(10):2576–2592], Hoda et al., 2011 [Acta Agriculturae Scand Section A, 61: 12-20], Salces-Ortiz et al. 2015 [BMC Evolutionary Biology 15:7], Pariset et al., 2006 [Animal Genetics, 37, 290–292]).

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.

During my STSM I was able to reach this step.

Further tasks after my return, during 2017 year:

As I expected in my work plan statistical analysis will be performed after my return to my home institute ASAP. 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.

The proposed period of the mission allowed me to sampling all planned Romanian sheep breeds and to produce initial results of the comparative study among different sheep breeds based on SNPs of heat stress related genes variability and performing the genotyping work.

Debrecen (Hungary) 10.04.2017.