



GOAT-TSE-FREE, an European project for eradication of scrapie in goats

## National Work-Document for France

**Project Period:** September 2012 - August 2015

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**OBJECTIVE:** Starting PrP selection in the framework of the French Alpine and Saanen breeding schemes

### ACTIVITIES:

**Introduction** – After nearly 10 years of research it has been established that there exist “222K goats” that are genetically highly unsusceptible for scrapie. The “resistance” is enclosed in the protein PrP (prion protein) on amino acid 222 which in these goats is K (lysine) instead of the usual Q (glutamine).

In France, the two main dairy goat breeds, Alpine and Saanen, represent more than 90 % of the national goat population. Before any *PrP* gene selection, the allelic frequency of the K allele (or IRRKS allele when looking simultaneously at the five codons 142, 154, 211, 222 and 240 of the *PrP* gene, i.e K<sub>222</sub> allele) of the French Alpine and Saanen breeds is now well documented : around 0.074 and 0.040 respectively for the Alpine and Saanen breeds. These low frequencies, in agreement with other European results for these two breeds, means that about only 17 % and 8 % of the goats are K carrier respectively in French Alpine and Saanen breeds. Therefore starting selection of the K allele at the population level, with such unfavourable initial low frequencies of the K<sub>222</sub> allele, is a difficult challenge for Capgenes, which is the organization responsible for the national breeding schemes in Goat species including the French Alpine and Saanen dairy goat breeds.

**Plan:** The breeding schemes for the French Alpine and Saanen breeds rely on two open nuclei totalizing 170,000 goats in 800 herds whose breeders are active members of Capgenes organisation. These 800 herds are genetically connected via 80,000 artificial inseminations (AI) per year, which allows AI progeny-testing of around 70 to 80 young bucks per year, respectively 40 to 45 and 30 to 35 in Alpine and Saanen breeds. The selection scheme follows the usual two-step selection of AI sires : First, ancestor selection by around 1,600 assortative matings (using AI) between elite proven sires and elite dams of bucks from the 800 herds; Second, progeny-testing yearly of 70 to 80 AI Young bucks. Capgenes is responsible of the management of the two Alpine and Saanen breeding schemes, including owner of the AI bucks livestock.

These Alpine and Saanen breeding schemes are officialy agreed by the Ministry of Agriculture, specially regarding the AI bucks, both for sampling and proven bucks. On the other hand, the INRA animal genetic departement is in charge of the official breeding values estimations of livestock involved in these breeding schemes, and also involved in the conception and optimisation of these official breeding schemes. Therefore Capgenes is interested in INRA studies regarding different scenarios for starting PrP selection (K<sub>222</sub> allele) in French Alpine and Saanen breeding schemes.

## Aspects of the work:

The following steps are planned between INRA and Capgenes :

1. Organizing PrP genotyping of the AI Alpine and Saanen bucks, i.e. around 70 to 80 new young bucks per birth year. Genotyping will be carried out by Labogena lab at codons 142, 154, 211, 222 and 240.
2. Planning PrP genotyping of relevant (i.e. significant probability to be K carrier) young males born from assortative matings for possible selection before entering breeding center of young bucks.
3. Managing PrP genotyping of relevant (i.e. significant probability to be K carrier) elite dams from the 800 herds of the 2 Capgenes nuclei (Alpine and Saanen breeds) in the aim to optimize AI assortative matings next years regarding PrP selection.
4. The definition of relevant animals (males or females) to be blood sampled for PrP genotyping (steps 2 and 3 above) is based in a first step on ancestry information (fathers or paternal grand-fathers) of AI PrP genotyped bucks. Such screening could be insufficient particularly for Saanen breed (given the initial proportion of K carrier for this breed). Therefore a second step of screening of animals and Capgenes herds will be organized based on natural mating (NM) bucks born from AI PrP genotyped bucks, since it would be important to find sufficient elite K carrier animals. Such a second screening will included also information of offspring (males or females) found to be K carrier and born from no K carrier fathers, which means that the dams are expected to be K carrier (if pedigree is true), and this assumption is important to be validated if they are young dams which could be included in assortative matings next years.
5. Given PrP genotyping results and national genetic data base, analysis will be carried out to check if there is any association at the population level or linkage between milk production and morphology traits currently selected for and *PrP* genotypes. It is an important question to face when starting selection for PrP gene in favour of the  $K_{222}$  allele.
6. Studying different scenari for starting/including PrP selection in the present Alpine and Saanen breeding schemes as regular increase of the  $K_{222}$  allele frequency of the whole Capgenes livestock against selection for a subset of AI scrapie resistant AI bucks to face AI demand only for detected herds as scrapie infected.

## TIMING of ACTIVITIES:

Start project 1 september 2012

Years 1 and 2 – mainly devoted to steps 1 to 4 for starting PrP selection in Capgenes organization

Years 2 and 3 – mainly devoted to steps 5 and 6 when informations of steps 1 to 4 are available to permit to Capgenes responsables to decide for the intensity of PrP selection in French Alpine and Saanen breeding schemes.

## PARTNERS:

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