SHORT TERM SCIENTIFIC MISSION (STSM)
SCIENTIFIC REPORT

This report is submitted for approval by the STSM applicant to the STSM coordinator

Action number: CA15224 - Identifying causes and solutions of keel bone damage in laying hens
STSM title: Epigenetic marks to assess welfare and behavior in laying hens
STSM start and end date: 2019-09-23 - 2019-09-28
Grantee name: Fábio Pértille

PURPOSE OF THE STSM:

The purpose of this STSM was to join efforts from a group of researchers from different areas but with same aims. Our idea was to investigate how epigenetic marks could improve animal welfare practices. For that, it was essential to get together for a deep brainstorm into the understanding of how epigenetics correlates with behavioral patterns in the brain and peripheral cells. We think that, using epigenetic tools will make it possible to identify positive and detrimental conditions in the production environment, and consequently to improve the welfare of laying hens, which includes prevention of keel bone damage. In this sense, we will be able to identify if animals have been exposed to detrimental conditions during their lives in the production environment. We took advantage of the use of peripheral cells from live animals to allow the rapid evaluation of previous exposures or health / welfare status.

In short, our goal is to provide an understanding of the causes behind behavioral variation in farm animals, especially in relation to their preferences or needs into the deeply controlled environment they live.

DESCRIPTION OF WORK CARRIED OUT DURING THE STSMS

It was a very productive and intense meeting week held in Switzerland and hosted by Dr. Michael Toscano from Bern University.
Initially, we spent hours discussing ways to integrate the knowledge areas among researchers within the topic of animal welfare and phenotypic variation into the different barn conditions where the experiment was conducted. Then, we moved to concrete actions using our joint capabilities.
Particularly, my contribution was more focused on bioinformatics analysis to integrate epigenetics and make it comprehensive for the other participants.

After each one exposed their expertise, we get notes of the convergence points of common understanding. The points of divergence were further discussed until they converged in a common idea. Finally, we gather and interpret all information derived from the data collected and generated from the analysis to convert into a manuscript draft.

DESCRIPTION OF THE MAIN RESULTS OBTAINED

The results of the STSM include the drafting of a manuscript to be soon submitted on the topic of epigenetic basis of behavioral individuality. We analyzed data emerging from a relatively large and uniform population of laying hens to identify the relationship between behavioral patterns (detected with novel metrics) and epigenetic variation in a brain region involved in the processing of higher cognitive abilities (nidopallium). We found results supporting the position that the natural emergence of behavioural variation in chickens is mainly related to epigenetic variation within brain

tissues. We identified linkages between chickens belonging to different behavioural classification schemes and differential DNA methylation in the nidopallium. Interestingly, these were mainly located in regulatory genomic regions, that were, moreover, functionally concordant with their specialized abilities.

FUTURE COLLABORATIONS (if applicable)
We have solid plans for future collaborations within the same group and with common goals.
These goals include the investigation of the epigenetic basis and mechanisms of behavioral individuality at a developmental level, and the identification of detrimental conditions in the production environment, such as keel bone damage.
The achieve of these goals is scheduled to be held in Sweden in a future research retreat. In addition, we are totally in agreement with future funding sources applications in partnership with Dr. Michael Toscano research group.