



Scientific Report for Short Term Scientific Mission (STSM)

”Using the effect of space allowance on feeding, drinking and resting behaviour in assessing heifers’ welfare”

COST ACTION: FA 1308 DairyCare

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Beneficiary: Dr. Iulian Tripon

Home Institution: Banat’s University of Agricultural Sciences and Veterinary Medicine, Timisoara, Romania

Coordinator of the STSM: Dr. Evangelia N. Sossidou, Veterinarian – Senior Research Scientist

Host Institution: Veterinary Research Institute, Hellenic Agricultural Organisation - DEMETER, Thessaloniki, Greece

Purpose of the STSM:

The aim of this Mission was:

For the applicant to be trained and acquire new knowledge and skills on modern techniques for measuring and analysing animal behaviour and welfare and more specifically, on the assessment of heifers’ welfare based on behaviour measurements;

For the institutions involved, the exchange of know how in the field of dairy cattle behaviour and welfare.

The main objectives of STSM was (a) analysis and interpretation of the data derived from previous trials to evaluate the effect of the different space allowance on the behaviour of heifers and (b) writing of at least one scientific publication to be submitted to a SCI journal

Description of the work carried out during the STSM

The analysis of data was done at the Veterinary Research Institute of the Hellenic Agricultural Organisation – DEMETER. Data used was previously collected at the research farm of Banat's University of Agricultural Sciences and Veterinary Medicine in Timisoara.

Data collection

More specifically, 25 twelve month old and 25 eighteen-month old heifers were randomly assigned to four pens, 5 per pen for each age category. Three of the pens had different feed space allowances 0.4, 0.6 and 0.84 m feeding space per heifer, a resting space of 25.0 m² and a water trough with 0.25 m² water surface. The fourth pen had 0.84 m feeding space per heifer, 25.0 m² resting space, but a water trough with water surface of only 0.19 m². The fifth pen had 0.84 m feeding space per heifer, a water trough with 0.25 m², but only 22.5 m² resting space. Water was provided in PVC water troughs with a capacity of 70 and 90 litres. The feed space allowance was calculated as the length of all feeders in pen divided per number of heifers (Vasseur et al. 2015). Heifers were housed using straw bedding according to Council Directive 2010/63EU on the protection of animals used for scientific purposes. Twelve months old heifers body weight (BW) and age were: BW = 329.0 ± 21.7 kg, age = 385.3 ± 16.0 (mean ± S.D.). Eighteen months old heifers body weight (BW) and age were: BW = 445.8 ± 20.4 kg, age = 561.9 ± 20.5 (mean ± S.D.). Heifers were fed with 1.2 kg of concentrates mixture and 35 kg alfalfa fresh grass.

The behaviour of calves was video recorded continuously for 24 hours. Behavioural measurements were made for feeding, drinking, rumination and resting behaviour.

In order to minimize the statistical error, the same observer made all behavioural observations while the recorded material was divided in three periods for every 24 hours of surveillance: 07:00 to 15:00 h (morning), 15:00 to 23:00 h (afternoon) and 23:00 to 07:00 h (night).

Data analysis

Averages and standard errors of the means were computed. Following the analyze of variance it was decided that the best method to use in testing the significance between experimental groups was the non-parametric Mann-Whitney U test (Wilcoxon) (Steele and Torrie 1960). This is a nonparametric test of the null hypothesis that two populations are the same against an alternative hypothesis, especially that a particular population tends to have larger values than the other. Data analysis' was made using MINITAB[®] (United States and other countries) software. The confidence level used for the acceptance of statistical hypothesis was $\alpha = 0.05$, $\alpha = 0.01$, $\alpha = 0.001$.

Data interpretation

The interpretation of the results demonstrated that the size of feeding, drinking and resting space had a significant effect on the behaviour of heifers.

Twelve months old heifers fed themselves for 505 minutes when the size of feeding space was 0.84 m per heifer, less with almost 2 hours than when the size of feeder provided 0.6 and 0.4 m feeding space per heifer (598 and 620 minutes). The differences between the smaller feeding space and the other two were significant ($P \leq 0.05$). The size of feeding space had a significant influence on eighteen months old heifers feeding behaviour ($P \leq 0.05$) during 24 hours. Heifers fed for 453 minutes when the feeding space allowance was 0.84 m per heifer,

641 minutes when the feeding space allowance was 0.6 m per heifer and 543 minutes when the feeding space allowance was 0.4 m per heifer. The size of water troughs influenced the time spent drinking by twelve and eighteen months old heifers in 24 hours but the differences were not significant ($P \geq 0.05$).

The size of feeding space influenced the time spent ruminating by twelve months old heifers in 24 hours but the differences were not significant ($P \geq 0.05$). The rumination time decreased from 503 minutes a day to 480 and 466 minutes as the feeding space was increased from 0.4 to 0.6 and 0.84 m per heifer. Heifers rested for 797.6 minutes when the resting space was 4.5 m² per heifer and only 654.4 minutes when the resting space was 5.0 m² per heifer ($P \leq 0.05$). The size of feeding space influenced significantly the rumination behaviour of eighteen months old heifers in 24 hours ($P \leq 0.05$). The time spent ruminating decreased from 535.7 minutes when heifers were fed using 0.4 m feeding space per heifer to 482.3 minutes when the size of feeding space was 0.6 m per heifer ($P \leq 0.05$). Heifers rested for 872.7 minutes in 24 hours when the resting space was 4.5 m² per heifer and 676.7 minutes when the resting space was 5.0 m² per heifer ($P \leq 0.05$).

Conclusions

It was concluded that the feeding and drinking behaviour were influenced significantly by feeding and resting space allowance making them suitable to be used in assessing heifer's welfare. Rumination and resting behaviour were influenced significantly by feeding and resting space allowance making them also suitable to be used in assessing heifer's welfare. Since there were no significant differences for feeding, drinking, rumination and resting behavior between the two age groups it was concluded that a welfare protocol that applies to both age groups can be used.

Description of the main results obtained

Main result of the STSM is the knowledge and skills acquired in the field's data analysis and interpretation of the results obtained from animal behaviour and welfare trials. The experience gained in data analysis and interpretation of heifers' behaviour provides me with the possibility to work in the future on identifying new indicators to assess dairy cattle welfare. Also, the experience gained working at the Veterinary Research Institute (Picture 1) under the coordination of Dr. Sossidou enables me to handle and work on my own in trials concerning different areas of dairy cattle rearing and welfare. The gain of these skills makes it possible for me to apply for research grants in order to develop my future research work.

After the data analysis of the research results was finished it was decided that the best way to present them is in two articles. The first paper concerns the effect of the time of the day, feeding space and water troughs dimensions on heifer's behaviour and welfare. The second paper is about how the effect of feeding and resting space allowance on rumination and resting behaviour can be used in assessing heifers' welfare.

During the STSM, I have visited the Laboratory of Molecular Biology (Picture 2) and the Laboratory of Food Hygiene and Technology of the Veterinary Research Institute. Following those visits I was able to find out the type of research that can be made with the help of the equipment that those laboratories have. This will hopefully open the way for future collaborations on the fields of cattle behaviour genetics and food safety.

Another important fact of my stay was that I could join the post-doc fellows group at the Veterinary Research Institute, who currently is working on Post Doctoral Action "Research and Technology Development Innovation Projects" - AgroETAK. I was able to exchange ideas about their researches as well as about my own. A common task that was widely

discussed and was the theme of a collaboration that took place here was the development of different types of ethograms for cattle behaviour evaluation under heat stress. This may prove very important for future collaborations.

Finally, during my stay I had the chance to visit the Zootechnia Trade Fair which is the biggest international fair for livestock and poultry in the Balkans' area. Visiting this fair allowed me to be in contact with the animal breeding industry in Greece and probably will help me in choosing my research themes.

Future collaboration with the host institution:

This STSM fostered the existing research network and the collaboration between the Veterinary Research Institute of Thessaloniki and the Banat's University of Agricultural Sciences and Veterinary medicine from Timisoara, with both institutions being currently concerned in finding new opportunities for common collaborations on research grants.

Foreseen publications/articles resulting from the STSM

Following the data analysis made during my STSM, two scientific papers have been written to be submitted to ISI Thompson Reuters ranked journal, with acknowledgements to the DAIRYCARE COST Action FA 1308.



Picture 1: The Veterinary Research Institute, Thessaloniki



Picture 2: The Laboratory of Molecular Biology of Veterinary Research Institute, Thessaloniki

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