SHORT TERM SCIENTIFIC MISSION (STSM) SCIENTIFIC REPORT

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

Action number: CA 17110
STSM title: WG2. Data requirement and availability
STSM start and end date: 04/03/2019 to 15/03/2019
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PURPOSE OF THE STSM

The SOUND-control Consortium has recently started working on the development of an adaptable framework to validate the confidence of freedom and to redeem established programs for non-regulated cattle diseases in the European Union.

This STSM aims to determine which data are required to estimate freedom of disease of Paratuberculosis and Bovine Viral Diarrhea (BVD) for different control programs in dairy cattle and what their availability is in selected countries. During this STSM, the visitor is expected to learn about the design of control and eradication programs for these two diseases, as well as, critical aspects involved to estimate freedom of disease.

DESCRIPTION OF WORK CARRIED OUT DURING THE STSM

This STSM was organized by Prof. Hans Houe and Prof. Søren Saxmose Nielsen as the host institution at the University of Copenhagen in Copenhagen (Denmark) visited by Violeta Muñoz-Gómez (ECVPH resident at SAFOSO, Switzerland).

The work development was designed as individual work, carried out by the visitor, with five joint scheduled meetings in which both, hosters and the visitor provided feedback and updated the daily work. Both hosters were also available to solve doubts and provide guidance through informal meetings when it was needed.

The following activities were accomplished during the two weeks. These activities are focus on the diseases of Paratuberculosis and Bovine Viral Diarrhea (BVD) in dairy cattle.

Week 1 (4-8th March 2019)
- Introduction to the Animal Welfare and and Disease Control group and to the SOUND-Control Project.
- Identification of pathogenetical issues of the aforementioned diseases.
- Review basics and methods involved in evaluating diagnostic tests.
- Identification of key parameters to estimate freedom of disease for the aforementioned diseases in selected countries.

Week 2 (11-15th March 2019)
- Design of a framework with relevant parameters to declare freedom of disease and gather such information from the existing literature.
- Exploration of different approaches to declare freedom of disease for the aforementioned disesases.

▪ Collation the plan for the report.

DESCRIPTION OF THE MAIN RESULTS OBTAINED

Results related to the working plan:

(1) **Main pathogenetic challenges and potential measures for the control and eradication of Paratuberculosis and BVD**. This task was planned as a first step to facilitate the immersion into the two selected diseases in order to grasp the knowledge of different control and eradication programmes. For paratuberculosis, some of these challenges are the age-related susceptibility, the detection of infected animals due to the low sensibility of current diagnostic tests and the occurrence of many subclinical cases with low and intermittent faecal bacteria shedding. Potential measures to overcome these challenges involve bio-exclusion practices such as the introduction of stock from low-risk paratuberculosis herds and the reduction of exposure to the causate agent (i.e. *Mycobacterium avium* subsp. *paratuberculosis*) through, for example, contaminated feed. In the case of BVD, the main pathogenic challenge includes the detection of persistent infectant (PI) animals as many of them might remain clinically normal and/or be BVDV Ab-positive due to colostrum intake. Some successful measures to identify PI animals involve the isolation of purchased pregnant cows and calf testing before the herd inclusion. In case vaccination is considered, the identification and removal of PI is essential due to PI and vaccinated animals cannot be differenciated.

(2) **Framework draft with key parameters to declare freedom of disease**. This task involved much individual reading and many discussions about parameters of interest, existing diagnostic tests strategies and purposes of declaring herds free of selected diseases etc. We discussed for example why in the Danish Paratuberculosis control programme it is not recommended re-testing positive or unclear results using the same diagnostic test. In this framework, data requirements were divided in three different levels: context, program and technical. The technical level was subdivided in two sublevels, test conditions and test strategy. The aim of this framework was to gather information on the selected parameters from the participating COST Action countries. The framework design was continuously updated during the meetings until an agreement of the version was achieved. Data gathering based on existing literature was carried out with a focus on Denmark and the Republic of Ireland. Some information from other countries was also included if it was available and the working time allowed it. Much of the information needed might not be publicly available.

(3) **Approaches to declare freedom or low prevalence estimates of disesase**. Three approaches were identified and discussed. One of the approaches was developed by Sergeant et al (2008) and it focuses on Paratuberculosis. It consists on a Bayesian model in which the true herd prevalence and the probability of freedom was estimated in Danish dairy cattle. As prof. Søren was involved in this study, he could share the R code and provide some explanations on this study. Other approach is a more common one from the Risk-based disease surveillance manual (FAO, 2014) and it was just briefly discussed. Last, but not least was the Norwegian approach developed by Norström et al (2014), which applies an scenario tree modelling on BVD. In this model, input parameters involve herd level design prevalence and within herd design prevalence for example, and herd true prevalence and the probability of freedom as out parameters. Many input parameters from this study are similar to the ones selected to estimate freedom of disease for Paratuberculosis and BVD.

As a result of this STSM, a data framework was created in an Excel spreadsheet with 1) General aspects of the data; 2) Pathogenical challenges of Paratuberculosis and BVD; 3) Data requirements for Paratuberculosis; 4) Data requirements for BVD; 5) References. This data framework can be used to determine whether the probability of freedom can be calculated.

Results out of the working plan:

The visitor had the chance to meet and expand her network with the rest of the team from the section for Animal Welfare and Disease Control, who were very welcoming and integrated her as one of the team members. This opportunity was very enrichising and allowed to have interesting conversation topics in relation to, for example, professional career or topics of common interest.

Picture: Some members of the team of the Animal Welfare and Disease Control section.

References
Norström M, Jonsson ME, Akerstedt J, Whist AC, Kristoffersen AB, Sviland S, Hopp P, Wahlström H. Estimation of the probability of freedom from Bovine virus diarrhea virus in Norway using scenario tree modelling (2014). Preventive Veterinary Medicine 116, 37-46.

Sergeant ESG, Nielsen SS, Toft N. Evaluation of test- strategies for estimating probability of low prevalence of paratuberculosis in Danish dairy herds (2008). Preventive Veterinary Medicine 85, 92-106.

FAO. 2014. Risk-based disease surveillance- A manual for veterinarians on the design and analysis of surveillance for demonstration of freedom from disease. FAO Animal Production and Health Manual No. 17. Rome, Italy.

FUTURE COLLABORATIONS (if applicable)

Future collaborations were mentioned during the STSM application process. The leader of WG2 invited the visitor to present the results of this STSM at the end of March in The Netherlands during a meeting of WG2. Unfortunately, the visitor is not able to make it as another business trip was already scheduled. Prof. Hans and prof. Søren will attend this meeting and present the results. One of the collaborators of WG2, who will attend that meeting and lives in the same city as the visitor, offered helself to give an update of the meeting.

References
Houe, H, Rosenbaum, L., Saxmose, S. (2014). Control and Eradication of Endemic Infectious Diseases in Cattle. College Publications.

Saxmose Nielsen S. (2009). Paratuberculosis in Dairy cattle- Epidemiological studes used for design of a control programme in Denmark. Department of Large animal Sciences. Faculty of Life Sciences. University of Copenhagen.