SHORT TERM SCIENTIFIC MISSION (STSM) SCIENTIFIC REPORT

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

Action number: CA17136
STSM title: Imaging exposure of lung tissue to indoor air particulate matter
STSM start and end date: 03/04/2019 to 13/04/2019
Grantee name: Kati Huttunen

PURPOSE OF THE STSM:

(max.200 words)

We are currently investigating how moisture problems in buildings affect the indoor microbiome, and how the qualitative and quantitative aspects of the microbiome in turn relate to the cellular signals in human lung epithelia. Overall, our work aims to improve the understanding of dampness related respiratory health effects.

The purpose of this Short Term Scientific Mission was to characterize indoor air particulate matter samples and acquire high quality images of lung tissue exposed to the PM. The experiments were designed to reveal the feasibility of ready-to-use lung tissue inserts (Mattek), and their comparability to tissues differentiated from primary basal cells.

In addition, as the applicant is the Scientific Communication Manager of the Action, the secondary aim of the visit was to participate in STEM activities organized to engage public (especially young students) in science. Importantly, during the STSM visit the applicant also met with Action Chair Nicola Carslaw at University of York to finalize the website of the Action. During the meeting the content and organization of the member area were discussed in detail, as well as the dissemination activities related to the launch of the website.

DESCRIPTION OF WORK CARRIED OUT DURING THE STSMS

(max.500 words)

The visit started on 3rd of April with travel from Kuopio, Finland to Cardiff, UK. The main activity of the next day (April 4th) was a seminar presentation “Human lung constructs as a model to study exposure to indoor air particulate matter” at Organisms and Environment Division, School of Biosciences, Cardiff University along with meeting the host of the visit, Dr Kelly BeruBe and planning the upcoming experiments.

On Friday (April 5th) I assisted Dr BeruBe at a STEM event at Black & Mixed Race Health Fair, Fitzalen High School, Cardiff, where we talked to Year 9 & 10 students about diagnosing respiratory health issues based on color and consistency of mucus, importance of washing hands to reduce respiratory infections. We also did over 200 peak respiratory flow measurements to show the students how the measurements correlated with eg. hight, age, gender and respiratory conditions such as asthma.

The weekend (April 6th-7th) I developed the content and structure for the website of COST Action INDAIRPOLLNET together with the design company Great Shade Factory. In the beginning of the next week (April 8th-9th) I travelled to York to meet the coordinator of the Action, Nicola Carslaw at University of York to discuss the content on the website and dissemination efforts related to the launch of the website.

On Wednesday (April 10th) we were expecting to receive a shipment of ready-to-use lung tissue cultures shipped from US, but the shipment was delayed until the next day. The shipment arrived on Thursday (April 11th) and we carried on with the experiment, but with a very full schedule due to the delay in the delivery.

On Friday (April 12th) we exposed 48 sets of lung tissue constructs to PM collected from water-damaged and undamaged residential houses at cell culture facilities of Cardiff Metropolitan University. After 24 hour exposure, the experiment was finished on Saturday (April 13th) and samples were sent to be imaged in the microscopy unit at Cardiff University. I travelled back to Finland the same day, but arrived home a day later (April 14th) due to missing a train connection after a delayed flight.

DESCRIPTION OF THE MAIN RESULTS OBTAINED

The STEM visit to Fitzalan High School was very inspiring, and showed clearly that a hands-on activities are the best way to attract attention and interest among the students. A similar event would be possible to organize also in my home institute, even with limited funding and experience.

The development of the website took a big step ahead during the trip, as the content of the site is now collected and organized. The website is essentially ready to launch after going through the requirements of the General Data Protection Regulation, making sure that the possible data protection issues are dealt with.

The main result of the trip was the successful completion of the experiment with lung tissue constructs. One of the aims was to assess the usability of the ready-to-use lung constructs from Mattek, and this lung tissue model seemed to work very well despite the delay in the shipment. However, the short shelf-life, long shipping distance and possible delays in the shipping schedule mean, that a similar experiment would not be possible to execute in my home institute in Kuopio.

The second point tested in this experiment was to assess the well-being of the lung tissue after exposure to the carrier buffer of the PM, artificial lung lining fluid (LLF) as well as the PM samples suspended in the LLF. The transepithelial electrical resistance (TEER) measurements indicated, that the carrier buffer itself is somewhat harmful to the lung tissue.This is a very important point to consider also in the future experiments. Based on the TEER- measurements, the integrity of the tissue was not significantly compromised by the PM. The results of the imaging are currently being analysed, so a more detailed assessment of the effects of PM exposure will be done in the near future.

A video journal of the visit can be seen at https://www.youtube.com/watch?v=8uaTJFzia8s&feature=share

FUTURE COLLABORATIONS (if applicable)

Collaboration with both hosts of the visit (Dr Kelly BéruBé and Dr Rachel Adams) will continue in the form of drafting a manuscript on the findings. I will be working together with Dr Nicola Carslaw on the development of the website and planning the dissemination activities of the Action also in the near future.