

Short Term Scientific Mission (STSM) Report

STSM details

Title	Biomarkers of skin: evaluation of UV exposure and effects in workers
Participant	Alberto Modenese University of Modena & Reggio Emilia, Modena, Italy
Host	Sanja Kezic, Coronel Institute of Occupational Health, Amsterdam, Netherlands
Period	6 – 19 March 2016

Background

My current research interest are diseases that can be caused by ultraviolet radiation (UVR) in workers, with particular regards to the risk related to solar radiation (SR) exposure in outdoor workers (OW), and its prevention.

The increased risk of Non-melanoma and melanoma skin cancers (SCs) in OW is well known, but currently the knowledge on possible dose-response mechanisms and on the presence of thresholds for the appearance of UV-related effects has several limitations. One of the possible reasons is the difficulty to adequately evaluate long term exposure of specific target organs/tissues. Consequently, it is also difficult to assess the efficacy of possible prevention strategies to reduce SCs occurrence in workers. In my PhD project I work at the possible development of a methodology for assessing cumulative occupational and environmental exposure to SR, taking into account work and leisure activities and both objective and subjective exposure data. Since early 2015, the COST Action TD1206 “StanDerm” is a great opportunity for me to be part of an international group of researchers who are interested in my research field and offer a lot of different expertise. Hence, I can integrate my occupational medicine background with a specific dermatologic knowledge. In particular, for a further development of my research, a better knowledge of early markers of biological effects related to SR interaction in skin tissue is fundamental in order to associate these parameters with a cumulative exposure index.

Aim (purpose) of the STSM

The aims of this STSM were to:

- visit one of Europe’s most important institute for the prevention of occupational diseases - the Coronel Institute of Occupational Health in Amsterdam - and be

introduced to an international, multidisciplinary team to reach a higher level of expertise in research of skin exposure and adverse effects in workers, also participating in the discussion of a new study on the prevention of contact dermatitis in nurses

- deepen my knowledge on skin biomarkers useful to evaluate skin damage due to irritants, allergens and UV radiation
- participate in practical activities and acquire skills for taking skin samples (tape stripping technique)
- lay the foundation for high-level research in the field of the prevention of UV-related occupational skin diseases, in collaboration with other national and international research groups.

Work carried out during the STSM

- I was involved in the research activities of Sanja Kezic and her research staff (S. Koppes, M. Soltanipoor):
 - Discussion of a recent proposal for an interventional study to prevent actinic damage in outdoor workers.
 - Study of the possible applications of Atomic Force Microscopy (AFM) to evaluate nanoscale alterations of corneocytes.
 - Study of the main issues concerning the determination of filaggrin breakdown products, also known as Natural Moisturizing Factor (NMF), using the tape stripping technique for evaluating the characteristic of different dermatitis.
 - Discussion of a recent study proposal for the evaluation of a preventive intervention to reduce hand eczema in nurses.
 - Study of possible applications of tape stripping technique for the determination of NMF, and in particular *trans*- and *cis*-urocanic acid, to evaluate actinic damage in outdoor workers and to compare UCA isomers levels with exposure measurements.
- I visited the staff's laboratory to get familiar with the tape stripping technique for the collection skin samples
- I collected skin samples and saved them in test tubes.
- I participated at four meetings with the Coronel Institute and Netherlands Center for Occupational Diseases (NCvB) professors and researchers: Dr. P.P.F.M. Kuijer on 8th March, Prof. Dr. J.K. Sluiter on 9th March, Dr. S.J. Tamminga on 11th March and Dr. Henk van der Molen on 14th March. The meetings aimed at discussing further developments of my research and possible collaborations.
- Furthermore, I joined a symposium entitled "New aspects in the assessment of skin exposure in the workplace" organized by NVT - section occupational toxicology together with the Contact Group of Health and Chemistry (CGC). The symposium was aimed to discuss on occupational dermal exposure to chemicals and the related health effects, considering recent indications stated by the EU REACH-directives, and suggesting possible tools to evaluate skin exposure to various substances.
- On Monday (14th March), I gave a short lecture on my research interests and

background at a meeting of the research group of the Coronel Institute of Occupational Health in AMC, Amsterdam.

Main results obtained

The main results obtained are:

- to deepen my knowledge of biomarkers of skin damage and their evaluation method -> useful for my PhD thesis and considered for a further application of the method developed in my PhD for possible studies' proposals
- to take skin samples with tape strips and save them in test tubes -> useful for further research activities concerning tape strips evaluation of the skin barrier damage in sample of Italian workers
- to receive documents containing data on the UV exposure of various outdoor sports -> useful for my PhD thesis
- to acquire data and methods for the evaluation of workers who are returning to work after a sickness absence (for cancers, musculoskeletal disorders, work stress, etc)

Future collaboration with the host institution

- Possible collaboration for study groups of Italian workers' and patients', assessing their occupational solar radiation exposure and evaluating skin samples collected with the tape stripping technique to measure the NMF and UCA isomers, and perhaps also performing an Atomic Force Microscopy analysis: two possible study designs.
- Evaluating the occupational exposure to solar radiation of a small group of construction workers and controls with a questionnaire, a dosimetric measurement and the collection of tape strips skin samples of different exposed skin areas at the beginning of the week, at the end of the first working day, at the end of a week and after one month, during a sunny month, in Italy.
- Evaluating cumulative solar radiation exposure in a group of voluntary patients affected from NMSCs, taking also tape strips of the skin areas close to the cancerous lesions (field of cancerization), assessing the skin damage at time zero, and then, after a specific preventive intervention (for example application of sunscreens), after one month and maybe later.
- Possible Italian applications of various methodologies developed at the Coronel Institute of Occupational Health to assess workers' abilities to return to work after sickness absence, including the translation and validation in Italian language of questionnaires developed (e.g. "Weighted composite work functioning measurement approach" by E.J. Boezeman, J.K. Sluiter and K. Nieuwenhuijsen. / "Quality of working life questionnaire for cancer survivors" by De Jong M, Tamminga SJ, De Boer AG, Frings-Dresen MH. / "Questionnaire to score the impact of knee complaints on work: the WORQ" by Kievit AJ, Kuijer PP, Kievit RA, Sierevelt IN, Blankevoort L and Frings-Dresen

MH.

Foreseen publications/articles resulting from the STSM

- Publication of my PhD thesis in March 2017 (topic: development of an integrated method to estimate cumulative solar radiation exposure of outdoor workers).
 - Among possible applications of the SR evaluation method, the idea of a tentative correlation of the UV exposure index developed and early biomarkers of UV skin damage, such as the accumulation of cis-UCA, will be taken into account in the discussion of the thesis.
 - Relevant UV exposure data concerning leisure exposure during outdoor sports (suggested by Prof. C.T.J. Hulshof of the Coronel Institute) will be considered in the development of the evaluation method of cumulative SR exposure, including leisure activities, and published in my PhD thesis.
- Possible publication of 2-3 scientific papers based on the activities performed during my STSM, on the main results obtained and on the possibility of a future collaboration with the host institution.

Other comments

Alberto Modenese
PhD student
University of Modena and Reggio Emilia, Modena, Italy

21 March 2016