KU LEUVEN

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Forensic Biomedical Sciences

Short Term Fellowships of the International Society for Forensic Genetics (ISFG)

Short Report – Research Visit, University of Surrey, UK, 12/06 till 07/07

Applicant
Lode Sibbens
Laboratory for Forensic Genetics and Molecular Archaeology
Kapucijnenvoer 33, Blok I – Bus 7001, 3000 Leuven, BE

Purpose of travel

My PhD topic concerns the determination of time of death (ToD) in forensic investigations using circadian/daily rhythms. Previous studies have shown the applicability of circadian rhythms in ToD estimation (Li 2013, Chen 2016) and timing of trace deposition (Lech 2016). As part of this project, multiple biomarkers will be examined in human post mortem (PM) blood samples: the transcriptome using RNA-Sequencing, the metabolome using LC-MS and several hormones using targeted ELISA essays. Based on a selection of robust biomarkers, a prediction model will be created to predict ToD.
This research visit had several objectives.

1) Direct training in circadian rhythm assessment and prediction modelling in R
2) Collaborative meetings with academics at University of Surrey and the Sleep Research Centre

Main outcome of research visit

1) Training

In order to mimic my own data, RNA-Seq data from single time point samples from single individuals, I worked on a similar, publically available microarray dataset from two distinct brain regions (Chen 2016). I performed circadian analysis of the transcripts using different techniques for non-equidistant time series and compared them with the original results under supervision of Dr. Emma Laing and her colleagues. Additionally, I was trained in the different aspects of prediction modelling which I performed on the dataset. This was still ongoing at the time of departure and the discussions will continue via mail or skype meetings.

2) Collaborative meetings

Meetings with the academics from the sleep research centre (dr. Derk-Jan Dijk, dr. Simon Archer and dr. Jonathan Johnston) were extremely interesting as they provided insights in my research project from the knowledge they obtained studying living individuals like the effect of meal timing, ageing and other influencing factors on my study population.
Meetings with researchers involved in metabolomics research (dr. Melanie Bailey and dr. Debra Skene) opened up the possibility to perform the targeted metabolomics analysis at Surrey. Together with Melanie Bailey, we discussed the possibility to use paperspray-MS on our samples instead of the standard LC-MS. Debra Skene recommended the Biocrates p180 kit but we will have to look in the financial aspect of this kit. Further logistics will be discussed over mail.
The possibility will be explored to take multiple tissues in our study population (deceased individuals with known ToD). This is not possible in standard circadian analysis due to distress and ethics in living subjects. The availability for sampling skin and/or adipose tissue from our 24-hour series post-mortem will also be very useful to analyse post-mortem effects on RNA abundance in these tissues.

3) Additional outcomes

During my stay at the University of Surrey, I presented my (future) work at the DREAM meeting involving academics and researchers outside the chronobiology field. Moreover, I attended the Summer 2017 UK Clock Club at Bristol, a congress for all researchers working on circadian rhythms and sleep in the UK.