

## **Laura Booth BTS Student Bursary recipient 2023**

### **BTS Annual Congress 2023, Birmingham UK**

#### Well, “oil” be damned! Sebum is an emerging analyte for metabolomics assays

At the BTS Annual Congress 2023 Professor Perdita Barran delivered a fantastic lecture on the potential of sebum as an analyte in metabolomics assays, which made everybody sit up in their seats (no mean feat on the final afternoon of the congress!). At the heart of the science was a human story.

Many years ago, Joy Milne, a retired nurse from Scotland, began to notice that her husband Les had developed a “woody” scent, and some twelve years later, he sadly developed symptomatic Parkinson’s Disease (PD). Joy attended a public lecture at the University of Edinburgh by neurobiologist Dr Tilo Kunath, where she asked him “if Parkinson’s had a smell to it”. After turning the question over in his head and getting in touch with Joy, Dr Kunath, Professor Barran and colleagues put together a small pilot study where Joy discovered she really could “smell Parkinson’s” by smelling T-shirts that had been worn by patients overnight and correctly distinguishing PD and non-PD patients. Joy didn’t achieve a 100% accuracy rate however: she identified one of the non-PD patients as having PD. However, many months later, the same patient returned to Dr Kunath to inform him that he'd recently received a PD diagnosis! This striking finding supported the predictive power of Joy’s nose, and shone a big spotlight on this research.

The study authors realised that the likely culprit was sebum, a lipid-rich yellow biofluid, which had been secreted from patients’ skin and transferred onto clothing. Prof Barran’s group has pioneered the use of mass spectrometry (MS) to assess samples and define a PD metabolomic signature in patient sebum – so-called “sebomics”. Sebum is both an attractive sample substance and analyte: it can be collected quickly and non-invasively from patients, and is very thermally and temporally stable, making this a win for patients and clinical researchers alike. Perhaps the most impressive part of this process is the analysis time. In their 2022 JACS Au paper, the group detailed how they honed and refined this method so that each sebum swab can be analysed by paper spray ionization-ion mobility MS in just three minutes, which is considerably faster than current clinical mass spectrometry techniques.<sup>1</sup>

In a recent review co-authored by Prof Barran, the advantages of sebomics techniques in a wide range of fields are highlighted.<sup>2</sup> Given that sebum acts as a “sink” to environmental metabolites and exogenous substances, its potential as an analyte in toxicology metabolomics assays is clear – for example it could be used to assess environmental toxin exposure, and at high-throughput capacity too. The authors caution that challenges still remain: as an emerging biofluid, standardisation of sebum sample collection, metabolomics assays and downstream analyses will be crucial in harmonising studies to move the field forward. Professor Rob Chilcott and colleagues have previously highlighted the inter-individual differences in sebum composition and other “residual skin surface components” dependent on sex and ethnicity, and perhaps attributable to diet and hormonal levels.<sup>3</sup> The definition of a “normal” baseline sebum signature must therefore be inclusively and conscientiously established.

Overall, analysis of sebum in MS-based metabolomics assays represents an exciting prospect in toxicology, for now most obviously in clinical, forensic and environmental specialisms. New analytes and analysis pipelines like those pioneered by Professor Barran create new opportunities for more sensitive and efficient toxicity studies, for the benefit of human health and wellbeing.

1. Sarkar, D., Sinclair, E., Lim, S. H., Walton-Doyle, C., Jafri, K., Milne, J., Vissers, J. P. C., Richardson, K., Trivedi, D. K., Silverdale, M., and Barran, P. (2022) Paper Spray Ionization Ion Mobility Mass Spectrometry of Sebum Classifies Biomarker Classes for the Diagnosis of Parkinson's Disease, *JACS Au* 2, 2013-2022.
2. Géhin, C., Tokarska, J., Fowler, S. J., Barran, P. E., and Trivedi, D. K. (2023) No skin off your back: the sampling and extraction of sebum for metabolomics, *Metabolomics* 19, 21.
3. Shetage, S. S., Traynor, M. J., Brown, M. B., and Chilcott, R. P. (2018) Sebomic identification of sex- and ethnicity-specific variations in residual skin surface components (RSSC) for bio-monitoring or forensic applications, *Lipids in Health and Disease* 17, 194.