ASSESSING THE RELEVANCE OF SURFACE SAMPLING BASED ON LIQUID EXTRACTION COUPLED TO DIFFERENTIAL ION MOBILITY FOR QUANTITATIVE MASS SPECTROMETRY IMAGING

Tiffany Porta[1], Emmanuel Varesio[1], Gérard Hopfgartner[1]

1 - University of Geneva, University of Lausanne, School of Pharmaceutical Sciences, Life Sciences Mass Spectrometry, Geneva, Switzerland

Over the last decade, mass spectrometry imaging has become a popular technique to study the distribution of molecules on the surface of biological samples. However, the correlation between the localization and the absolute amount of the analytes in tissue remains challenging. Despite the advantages of maintaining spatial information of the sample and sensitivity, the identification and quantitation of isomeric or isobaric species is hampered by the lack of chromatographic separation.

To deal with both direct quantitation and analysis of isomers, a new analytical workflow was developed to generate simultaneous qualitative and quantitative data. This workflow consists in liquid extraction surface analysis (LESA) followed by a differential ion mobility separation (DMS), hyphenated to tandem mass spectrometry detection (performed in selected reaction monitoring and enhanced product ion scan modes). LESA[1] is a feature implemented on a chip-based infusion nanoelectrospray ionization robot for surface sampling and applied to study the distribution of drugs and their metabolites in postmortem tissue sections[2,3]. Hyphenated to LESA, DMS has the potential to resolve isomers in the gas phase at atmospheric pressure, based on their difference in ionic mobility when a varying separation field waveform is applied. In DMS mode, specific compensation voltages, required to allow transmission of each ion toward the mass analyzer, give an additional level of selectivity. The addition of organic modifiers in the gas transporting the ions has been proven to significantly enhance its separation power by the dynamic formation of clusters between the modifier and the ions[3,4].

The relevance of the LESA-DMS-MS platform for performing quantitation of a set of 30 drugs of abuse has been investigated for forensic purpose as well as the different experimental parameters that have to be considered. The data collected after the extraction of analytes from adjacent kidney sections display intra- and inter- sections reproducibility within the range of 0-25%. Calibration curves, built by spiking calibration standards and quality control samples onto blank kidney sections and spotting internal standards onto target, display linearity over three orders of magnitude, with good precision (< 15%) and accuracy (90-110%). The last step to classify LESA-DMS-MS/MS as a reliable platform for absolute quantitation from tissue sections will consist in analyzing reference samples.

[1] *Kertesz, V and Van Berkel, G.J. J. Mass Spectrom. 2010, 45, 252-260.*
[2] *Eikel, D. et al. Rapid Commun. Mass Spectrom. 2011, 25, 3587-3596.*
[3] *Porta, T. et al. ASMS Proceedings. 2012.*
[4] *Schneider, B.B. et al., Anal. Chem. 2010, 82(5): 1867-1880.*