

## **Abstract Lecture**

### **Seeing is believing: High resolution imaging mass spectrometry of cells and tissue**

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Imaging Mass spectrometry (IMS) [1] is an emerging molecular imaging tool in proteomics, lipidomics and metabolomics. Recent developments in this field allow the direct detection of biomolecules as proteins, lipids and drugs on cells and tissue. Mass spectrometric imaging is a powerful technique that enables us to identify and localize these biological compounds directly on tissue without the need for radioactive or fluorescence labels or immunochemical reagents. As such it is an ideal tool for molecular histology. Histopathology using H&E stained tissue sections is one of the established methods used to reveal molecular anomalies at the cellular and tissue level. It is commonly understood that a better fundamental understanding of the molecular basis of disease is rapidly changing health care. Diagnosis of diseases, classification of the stage of a disease, and the investigation of the efficacy of a treatment still rely on established and validated methods. Physics is contributing to this multidisciplinary research by the development of new tools for health care. We will describe and discuss one of these developments: molecular histology with high performance mass spectrometry. A number of methodological developments are needed to enhance to molecular detail that can be obtained from histological tissues. Spatial resolution, conformational separation and sensitivity are key parameters that are addressed in current imaging MS methodological developments.

In the study of molecular histology using mass spectrometry it is imperative to employ a number of complementary imaging techniques. Different MS based molecular imaging modalities exist that provide insight in different classes of molecules at complementary sensitivity and high spatial resolution. We developed a protocol combining MALDI, Matrix Enhanced SIMS and conventional SIMS for the analysis of various molecular classes on a single tissue section. This multimodal approach will be demonstrated in a study of a variety of diseases such as breast cancer and Alzheimer's disease.

#### *Reference*

[1] Liam A. McDonnell, Ron M. A. Heeren, Mass Spectrometry Reviews (2007) 26 606-643