

Ion mobility and molecular histology: New glasses for the doctor!

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The analysis of biological surfaces with imaging mass spectrometry is an analytical science that experiences a rapid growth as a result of many new fundamental insights and instrumental innovations. The prospect of a capability to directly analyze biomolecular distributions related to societal relevant diseases incited a huge interest by a number of new disciplines. Among those are biomedical sciences, molecular biology, genomic, proteomics and even systems biology. They all share a common interest: obtaining the quantitative spatial distribution of as many biomolecules as possible on a tissue surface preferably on a cellular level. Unfortunately there is no single technique that can provide all of this detail in concert. New, innovative methods are investigated that bring together experimental results from different imaging MS approaches, for example SIMS and MALDI. Combined they provide new molecular visualization tools for medical researchers.

The common histological tools typically only provide generic morphological information unless immunohistochemistry is used to determine the distribution one specific known protein. Imaging mass spectrometry has evolved to bring these two disciplines, mass spectrometry and histology. This approach, sometimes referred to as molecular histology, can take great benefit from the use of either high resolution mass spectrometry or gas-phase ion mobility separation. Both approaches combined with imaging mass spectrometry can reveal new tissue details that remain hidden with conventional molecular imaging approaches. In this contribution we will discuss the development and applications of these new chemical microscopes.