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RSC/ERDF Lecture

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“Profiling of biological tissues by ambient mass spectrometry - from imaging to surgery”

Dr Zoltan Takats
Imperial College London

Development of imaging mass spectrometry has allowed the mapping of molecular species in tissue sections and also provided a novel approach for the identification of different histological tissue types. We have developed a desorption electrospray ionization (DESI)-MS based method for the unambiguous pixel-by-pixel identification of tissue types in histological sections. The basis of identification is a large-scale histologically assigned database, which allows the recognition of important histological and histopathological features. While imaging mass spectrometry is shown to provide results comparable to morphology-based analysis, the information content of mass spectrometric imaging datasets goes well beyond morphology as it is demonstrated in case of KRAS mutations. The sole, unfortunately intrinsic drawback of imaging MS is its limited applicability, which restricts its use to the analysis of microscopic tissue sections. In contrast, the recently introduced Rapid Evaporative Ionization Mass Spectrometry (REIMS) technique allows the in-situ, in-vivo chemical characterization of biological tissues. Chief application area of the technique is cancer surgery, where it can be used to establish surgical margins. Following exploratory studies, we have performed the first large scale study aimed at the validation of the tissue identification capability of the method in surgical environment.



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