Ion mobility spectrometry as separation technique in glycan analysis

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Currently, the vast majority of glycans are characterized using mass spectrometry-based techniques (MS). Measuring the molecular weight of a sugar, however, immediately poses a fundamental problem: entire classes of monosaccharide building blocks exhibit an identical atomic composition and, consequently, an identical mass. Therefore, glycan MS data can be highly ambiguous and often it is not possible to clearly assign a particular structure. A promising approach to overcome this limitation is to implement an additional gas-phase separation step using ion mobility-mass spectrometry (IM MS). Here, ions travel through a gas-filled cell aided by an electric field and are separated according to their collision cross section (CCS).

Here, we demonstrate the potential of IM-MS to be used as a tool for the separation and identification of isomeric glycans and glycopeptides. First, six synthetic oligosaccharide isomers that differ with respect to their composition, connectivity, or configuration were analyzed. Our data reveal that linkage- and stereoisomers, which are difficult to distinguish using established techniques, can be separated and unambiguously identified on basis of their CCS. When mixed, even minor isomeric components with concentrations as low as 0.1% are still clearly detectable.[1] Second, we extended our investigations to glycopeptides. Our data show that glycopeptides, which merely differ in the regiochemistry of the attached glycan can be distinguished using fragmentation and subsequent IM-MS analysis.[2] Further studies revealed that a similar approach can also be used to identify typical features in larger glycans.

References

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