

Abstract for general public

Mass spectrometry is one of analytical techniques used for identification of molecules based on their mass. In order to analyze a compound by means of mass spectrometry, the analyte has to be charged – ionized. Only ions are accelerated in an electric field. The ions reach the analyzer and they are identified based on their mass-to-charge ratio (m/z). There are several kinds of spectrometers, equipped with different ion sources and different analyzers. Besides qualitative analysis, there is a possibility to perform quantitative analysis by mass spectrometry. Moreover, mass spectrometry can be coupled with other techniques, e.g. liquid chromatography (LC), which enables separation of mixtures before MS detection. Moreover, using Multiple Reaction Monitoring (MRM) – one of the spectrometer modes – enables selected monitoring of the fragmentation reaction of tested compounds. The scheme of the experiment is presented in Figure 1.

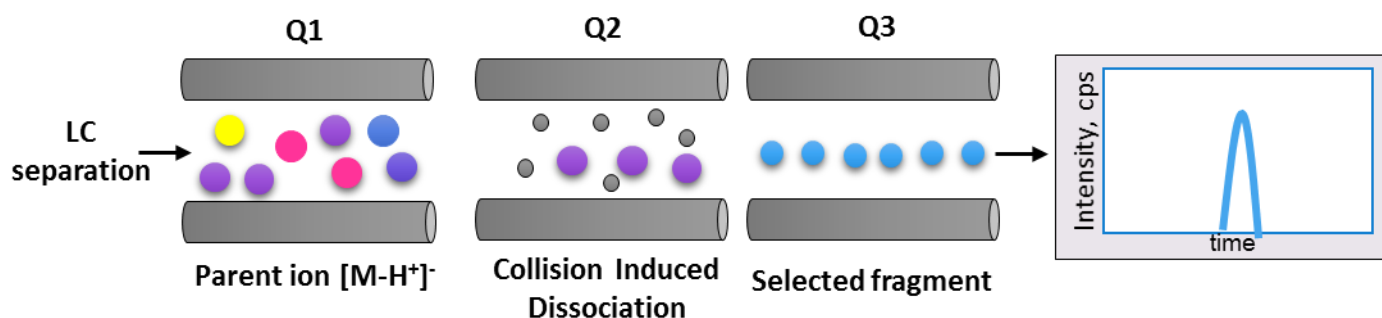


Fig.1. Scheme of MRM experiment.

In this project, we plan to apply mass spectrometry with electrospray ionization and triple quadrupole (low resolution analyzer) coupled with high performance liquid chromatography to analyze modified RNA. We will analyze RNA analogs with high therapeutic potential. Thereupon precise structure analysis of those compounds, determination of amount and kind of modification is crucial. In this project we are focused on the procedure and method development which enables precise determination of the nucleotide modifications introduced to RNA. There are three main project stages: (i) synthesis of isotope labeled compounds with oxygen ¹⁸O which features are very similar to analysed compounds, (ii) selection of an appropriate chromatographic parameters and optimization MS parameters, (iii) method application to analyse modified RNA.

Developed method will be useful for analysis of model RNA molecules and also identification of the products of metabolism of modified RNA in cells, which is very important for using those compound as therapeutic agents. Furthermore, developed method contributes to the common use of low resolution spectrometers in investigation of large molecules such as RNA and DNA.