Comparing and Contrasting the Protein Characterization and Identification Capabilities of an Orthogonal MALDI QtoF Mass Spectrometer and a TOF/TOF™ Optics Mass Spectrometer

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OVERVIEW

MALDI-QTOF and Tandem MS have been proven to be methods of choice for the study of Proteomics. In situ quadrupole orthogonal MALDI QTOF (QTOF-QTOF) and in line TOF/TOF™ systems with an API source (TOF2) are systems that enable high sensitivity and rapid protein ID analysis despite their different design characteristics. Two such systems were compared in this study: MALDI-QTOF fragmentation coverage, and Zn ion sequencing capability. While simpler MSMS spectra are reported to be favored by low energy CID on wMALDI TOF MS/MS systems, these differing mass spectra (tag information) the TOF system is reported to yield high energy collisions and can resolve isotopic (i) and iota (J) by examining the high energy induced i, 3 i and J (2). In addition, this system is the system that is commercially available in the two systems. Calibration of the MALDI-QTOF system for Tandem MS and Ion Trap analysis was required for the new MALDI-QTOF system. The systems were also compared using gel digests to determine their sensitivity and performance throughout.

RESULTS

Figure 1 illustrates that both MSMS spectra are affected by the ions trapped, subsequently providing higher energy collision fragmentation with TOF/TOF™. Figures 2 and 3 illustrate that the MALDI-QTOF system has a higher sensitivity and performance coverage of information from the sample.

The analysis of the data points to a higher number of ions observed in the MALDI-QTOF system. The system with a higher number of observed ions has a higher sensitivity and performance coverage of information from the sample.

MATERIALS AND METHODS

Sample Preparation: 0.5 µL of protein mixtures (10 fmol each) of 205 proteins/peptide solution (2 µM) were spotted onto the MALDI plate, 100 µL of the sample plate was spotted onto the MALDI plate, an equal amount of sample (12.5 fmol) was spotted onto the MALDI plate, and subsequently the MALDI-QTOF system was utilized for the analysis. The system with a higher number of observed ions has a higher sensitivity and performance coverage of information from the sample.

Analytical Methods:

For the MALDI-QTOF, the experiments were carried out using a laser power of 30 mJ and 100 laser shots at 2000 lasers. For the TOF/TOF™, the experiments were carried out using a laser power of 20 mJ and 100 laser shots at 2000 lasers. For the MALDI-QTOF system, the experiments were carried out using a laser power of 30 mJ and 100 laser shots at 2000 lasers. For the TOF/TOF™ system, the experiments were carried out using a laser power of 20 mJ and 100 laser shots at 2000 lasers. For the MALDI-QTOF system, the experiments were carried out using a laser power of 30 mJ and 100 laser shots at 2000 lasers. For the TOF/TOF™ system, the experiments were carried out using a laser power of 20 mJ and 100 laser shots at 2000 lasers.

DISCUSSION

While the MALDI-QTOF and TOF/TOF™ appear to achieve similar results for the experiments undertaken, it is clear that there are some performance differences which help distinguish the relative strengths of the two systems. The TOF/TOF system clearly has a advantage with respect to the amount of time it takes to achieve a particular result. This can manifest itself in three ways. Firstly, it is that a higher number of ions is observed, with a higher number of observed ions having a higher sensitivity and performance coverage of information from the sample.

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