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### MASS SPECTROMETRY FOR FORENSIC INVESTIGATIONS

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Advances in analytical techniques have changed the way crimes are investigated. Mass spectrometric techniques such as Gas Chromatography Mass Spectrometry (GCMS) have been adopted into forensic laboratories for decades where, along with High Performance Liquid Chromatography (HPLC), they are the work-horse of forensic investigations because of their combined ability to identify and quantify chemicals at low detection limits.

The recent placement of Liquid Chromatography Mass Spectrometers in a number of forensic laboratories has seen a growth in the acceptance of, and applications for, LCMS. Collaborative groups such as Nitecrime (Natural Isotopes and Trace Elements in Criminalistics and Environmental Forensics) and FIRMS (Forensic Isotope Ratio Mass Spectrometry Network) have a mandate to increase the acceptance and use of Isotope Ratio Mass Spectrometry and Trace Element analysis by Laser Ablation Inductively Coupled Plasma Mass Spectrometry in environmental, criminalistic and forensic investigations.

However, modern developments of mass spectrometry, including MALDI-TOF-MS, IRMS, ESI-MS<sup>n</sup> etc, offer great advances for forensic investigations but forensic laboratories tend to be slow in taking up new techniques, in-part, because of the requirement to use well tested and accepted methods for court presentation. Collaboration between researchers at Flinders University and Forensic Science South Australia, and through international networks, have undertaken research projects aimed at proving the usefulness of a range of new advanced analytical techniques to forensic investigations.

This paper will address some of the issues in providing convincing data from a range of forensic investigations by a range of new mass spectrometric techniques. with examples from research projects and case studies.