

Preliminary experience with the Waters Unispray™ source.

Brian G Keevil

Department Clinical Biochemistry, University Hospital of South Manchester NHS Foundation Trust, Southmoor Rd, Manchester, M23 9LT, UK and The University of Manchester, Manchester Academic Health Science Centre, University Hospital of South Manchester NHS Foundation Trust

The electrospray source has driven the development of LC-MS/MS for use in clinical laboratories but ion generation in the source is inefficient and consequent lack of sensitivity makes the analysis of some compounds challenging. In an attempt to improve sensitivity the Waters Unispray™ source is designed to enhance the ionisation process. A high velocity spray from a grounded nebuliser is arranged to impact on a streamlined rod target that is positioned in close proximity, perpendicular to the spray axis and horizontal to the ion inlet aperture. The stainless steel target is positioned upstream of the ion inlet aperture of the MS and typically held at a potential of 1kV with respect to the nebuliser and inlet. In the optimised Unispray™ geometry, the gas flow and droplets from the nebuliser strike the rod target on the upper quadrant that faces away from the ion inlet of the MS. Under these off-axis conditions, the gas flow follows the curvature of the rod and swings toward the ion inlet, a process termed the Coanda effect. The exact processes that lead to the enhanced sensitivity observed with the Unispray™ source are not fully understood but there is evidence of three phenomena that could play an important role in the Unispray™ source mechanism, namely spray electrification, the Coanda effect and surface gas flow microvorticity. We have tested the Unispray™ source in a routine clinical laboratory for a number of applications including steroids, therapeutic drugs and plasma metanephrines. The sources are interchangeable and it is a simple procedure to swap from the standard electrospray to the Unispray™ source, tuning is also simple. The source has proved to be robust and we have seen at least a three fold increase in sensitivity in negative ion mode for aldosterone and at least three fold increase in positive ion mode for plasma metanephrines and sirolimus. Gains in sensitivity are not seen for all compounds and we have seen no improvement over the conventional electrospray technique for either testosterone or androstenedione.

I would like to acknowledge Ed Sprake and Steve Bajic at Waters for their help and support.