

## Ambient Ionisation Coupled to Miniature Mass Spectrometry for the Application of Driving Under the Influence of Drugs.

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The UK government has introduced legislation for a suite of drugs known to cause impairment to help combat driving under the influence of drugs (DUID). The current preliminary tests have limitations, which has pressed for an improvement of screening methods for on-site analysis. Ambient ionisation techniques and their coupling to low-cost miniaturised mass spectrometers have demonstrated promise for routine in-situ analyses. Associated advantages include minimum sample preparation, and rapid data acquisition in real-time.

Preliminary experiments evaluated the use of atmospheric solids analysis probe (ASAP-) and thermal desorption (TD-) techniques in conjunction with a Waters QDa; which were assessed for their applicability to identify a small number of medicinal drugs in synthetic saliva and plasma, with the intention to support DUID incidents.

Calibration standards were prepared in methanol, synthetic saliva and crashed plasma. Methanol and synthetic saliva were spiked directly with the drug, whilst crashed plasma was dried under nitrogen before being reconstituted with the corresponding concentration of drug in methanol. Samples were introduced into the ASAP- and TD-QDa by capillary tubes and PTFE-fibreglass coated swabs, respectively. Infinite dilutions were analysed in each matrix to estimate the limit of detection (LOD) for each drug. Variable cone voltages generated analyte-specific fragment ions and introduced a degree of specificity not normally associated with this type of mass spectrometer. High selectivity was observed also.

Greater sensitivity was demonstrated by ASAP-QDa (LODs  $<1000 \text{ ng mL}^{-1}$ ) compared to the TD-QDa (LODs  $>1000 \text{ ng mL}^{-1}$ ). An unmatched internal standard (IS) improved the linearity and standard error at each concentration of the calibration curve, as a matched IS shared fragment ions with two of the drugs present in the multi-analyte solution. Plasma analysed by ASAP-QDa yielded the greatest results at the tested concentration range. Overall, ASAP-QDa demonstrated greater promise for use as an in-situ screening method.