A VALIDATED METHOD FOR THE DETERMINATION OF PMA AND OTHER AMPHETAMINE-RELATED DESIGNER DRUGS IN BIOLOGICAL MATRICES BY LIQUID CHROMATOGRAPHY SONIC SPRAY IONIZATION MASS SPECTROMETRY

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The appearance and re-appearance of designer drugs on the illicit drug market force the toxicologist to constantly explore for the unknown. Recently, paramethoxyamphetamine (PMA) has re-appeared on so-called 'rave parties' and on the dancing scene. This compound is often sold as 'ecstasy' (3,4-methylenedioxyamphetamine or MDMA) in tablets. PMA, however, has a slower onset of activity than MDMA, impelling some users to ingest more of these putative ecstasy tablets. Unfortunately, PMA appears to be more toxic than MDMA. This has led to some dramatic incidents where hyperthermia and heart failure resulted in a total collapse of the victim.

Therefore, a method was developed to simultaneously quantify PMA, MDMA, amphetamine and 3,4-methylenedioxyamphetamine (MDA) in blood, urine and postmortem tissue. Logically, the method can also be applied to confiscated powders and tablets. A mixture of hexane/ethylacetate (7/3, v/v) was used for liquid/liquid extraction, with recoveries ranging from 83.2 to 107.2%. Chromatographic analysis was performed on a narrow bore phenyl column, eluted in gradient mode at a flow rate of 0.3 ml/min. The mobile phase consisted of water containing 0.001% formic acid (solvent A) and methanol (solvent B).

In toxicological analysis, identification or confirmation of the analyte's identity is indispensable, and therefore a detection technique providing spectral information is preferred. An ion trap based mass spectrometer (MS), in this case the M-8000 from Merck-Hitachi, was used. To accommodate the MS with the continuous liquid flow of the column effluent, a sonic spray ionization (SSI) interface was used. This type of interface applies a high (sonic) gas flow coaxial to the capillary for the ionization of compounds. The protonated molecules $[M + H]^+$ were isolated and fragmented in the trap with helium as buffer gas. The most prominent fragments are monitored for quantification. The method was validated on whole blood, urine and postmortem tissue. Within-day and total reproducibility were always less than 17.5% and accuracy, (expressed as % error) did not exceed 16.2%. Six-point quadratic calibration graphs were constructed in all matrices (range 10 – 2000 ng/ml) and correlation coefficients (r^2) exceeded 0.995. Detection limits ranged from 2.5 to 10 ng/ml. The method was successfully applied to biological matrices of a multidrug user.