

TANDEM MASS SPECTROMETRY FOR THE ANALYSIS OF DRUGS OF ABUSE IN HUMAN HAIR

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As part of a study to monitor the drug use of patients undergoing a heroin withdrawal trial we investigated methods which would allow drug screening to be conducted on hair segments. Patients were undergoing maintenance treatment with methadone, l-alpha-acetylmethadol (LAAM) or naltrexone. In order to assess patients self reported drug use hair samples were collected and examined to reveal drug use over the preceding month. Drugs of particular interest were heroin and its metabolites and a selection of amphetamines and benzodiazepines. We sought a simple extraction step followed by identification of multiple drugs in a single chromatographic run.

Approximately 20 mg of each hair sample was incubated overnight at 45°C in methanol. The solvent was evaporated to dryness and the residue derivatized with pentafluoropropionic anhydride. The concentration of heroin and its metabolites in hair are typically in the range 0.1-5 ng/mg. Thus for 20mg hair samples the total amount of drug present is typically 2-100 ng. Accurate determination of these drug concentrations requires sensitive assays. Trial analyses were conducted by gas chromatography/mass spectrometry in both selected ion monitoring mode (SIM) using a benchtop quadrupole and tandem MS mode using an ion trap.

Minimal sample preparation of the hair produced some difficult matrices. Tandem MS provided improved signal to noise ratios for low drug concentrations compared with SIM. In addition, a product ion spectrum has the potential to provide a higher quality identification than the 3 ion ratios commonly used in SIM. Approximately 300 hair samples have been successfully analysed using tandem MS.
