Hair - The Novel Specimen for Routine Coroner’s Toxicology

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AIMS: Throughout 2004-2006 hair was taken in addition to the usual specimens of femoral vein blood, urine, and gastric contents in 286 coroners’ cases submitted for analysis. The aim of the study was to review the data from hair analysis and from conventional samples in these cases with a view to identify the case types where hair analysis, either alone or in combination with the results from other specimens, assisted the pathologist in establishing the cause of death and/or the coroner in reaching a verdict.

METHODS: The Toxicology Unit at Imperial College London has published a method using GC-MS in SIM mode for the simultaneous quantification of opiates, amphetamines, the cocaine group and diazepam/desmethyldiazepam from one 20-50 mg sample of hair [1]. By injecting a further aliquot on to the GC-MS using full scan, the same extract can also be screened for unknowns. To date 24 drugs have been identified using full scan including among others two anticonvulsants (carbamazepine, phenytoin), eight antidepressants (amitriptyline, citalopram, dothiepin, fluoxetine, mirtazapine, paroxetine, sertraline, venlafaxine) and three antipsychotics (olanzapine, quetiapine, thioridazine).

RESULTS: Analysis of hair has been found to be useful in identifying the following scenarios: 1) Compliance with prescribed medication. A 22 year old woman was seen to walk on to the train track, the train struck her and she died from multiple injuries. The deceased was being treated for depression and was prescribed citalopram. A 12 cm length of hair submitted for analysis was divided into 4 equal segments. Citalopram and its metabolite were detected in each of the segments. 2) For verifying long term drug use or demonstrating absence of it. A 29 year old male was found dead in the bathroom; a used syringe was found underneath the body. The deceased was a former addict, but the family believed he had not used heroin in the last three years. The results of analysis of postmortem blood demonstrated ingestion of a potentially fatal dose of heroin in combination with ethanol, dihydrocodeine, and cocaine, but analysis of a 5 cm length of pubic hair was positive only for dihydrocodeine and cocaine plus its metabolites. 3) Demonstrating presence or absence of tolerance. An 18 year old male was found dead in bed. The postmortem blood morphine concentration was 0.32 ug/mL, morphine and 6-MAM were detected in urine, but morphine only at a concentration of less than 0.4 ng/mg was detected in hair. 4) Demonstrating the widespread use of cocaine and its role in: a) Depressive episodes and suicide. Death occurred as a result of self-suspension in 36 of the 286 cases. Analysis of hair showed the presence of cocaine plus metabolites in 15 of these 36 cases, but in eight of the 15 cases no cocaine or metabolites were detected in the postmortem blood or urine; b) Sudden unexplained death relating to heart abnormalities. Five cases were identified where death was due to heart abnormalities with the analysis of hair demonstrating chronic use of cocaine; c) Cocaine-associated excited delirium. Three cases were identified in which hair analysis showed chronic cocaine and the postmortem blood concentrations were within the range associated with recreational use; d) The commission of crime. Among the 286 cases were eight victims of homicidal stabbing and two of homicidal shooting. Analysis of hair showed that five of the eight stabbing victims and both shooting victims had a history of chronic cocaine use. Postmortem blood was submitted with five cases and all were negative for cocaine.

CONCLUSIONS: Analysis of hair provides a reliable and helpful drug history for the pathologist and coroner. This is supporting evidence for establishing the cause of death and the verdict in a whole range of coroners’ cases. Analysis of hair provides evidence to indicate deaths due to chronic drug use.

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