

Additional Drug Information

When hair is analysed for drug use, a sample is taken from either the head or the body. It is washed to remove dirt and any external drug deposits, then stripped of melanin. The actual analysis is performed by Radioimmunoassay that detects not only traces of drugs but their *metabolites*; these are chemicals that appear only when the body has metabolized the drug. All positive samples are confirmed by gas chromatography/mass spectrometry (GC/MS). This second test has a cutoff level to eliminate specimens containing drug levels that could come from environmental exposure. To be considered positive a sample must show the presence of drug in these two assays using different techniques. This two step analysis is a strong efficient protection against false positive reports.

The Parliamentary Office of Science and Technology states on a report published on Hair Drug Testing in the UK: 'Gas chromatography-mass spectrometry (GC-MS) is considered by the Forensic Science Service the gold standard in hair testing. It is usually the only test which is accepted in the courts. GC-MS is the tool of choice because it has good sensitivity, selectivity, specificity, a high degree of standardization, sample throughput, and instrument ruggedness'.

Cutoff levels are the concentration levels above which the specimen is deemed to be positive and below which it is deemed negative for a particular drug. (Although there are no guidelines in the UK for cutoff limits, Trimega Laboratories utilises the guidelines for cutoff levels set by the Substance Abuse and Mental Health Services Administration as recommended by the Parliamentary Office of Science and Technology).

Drug

Cutoff Levels

Cocaine & Benzoylcegonine (Metabolite)	5 nanograms/10 milligrams of hair
Methamphetamine, Amphetamine & Ecstasy	5 nanograms/10 milligrams of hair
Opiates (Codeine, Morphine & 6-mam)	3 nanograms/10 milligrams of hair
PCP	3 nanograms/10 milligrams of hair
Total THC (Marijuana)	0.010 nanograms/10 milligrams of hair

Except for marijuana, this amount is approximately correlated to the severity of drug use. Hair cutoff values represent minimum concentrations for the detection of low-level chronic drug use.

The levels shown in Exhibit 1 document the correlation between hair levels and dose ingested. This data was acquired from various studies from numerous academic sources with admitted drug users.

Exhibit 1

5 Drug Panel	Confirm Cutoff	Low Use (weekends or recreational)	Medium Use (daily and/or weekends)	High Use (constant)
Amphetamines (amphetamine, methamphetamine & ecstasy)	5 ng/10 mg hair	5 - 25	25 - 75	>75
Cocaine metabolite (cocaine & benzoylcegonine)	5 ng/10 mg hair	5 - 20	20 - 100	>100
Opiates (codeine, morphine, heroin & 6-mam)	3 ng/10 mg hair	3 - 10	20 - 80	>80
Phencyclidine	3 ng/10 mg hair	3 - 5	5 - 10	>20
Marijuana metabolite	0.003 ng/10 mg hair	<u>Qualitative – amount does not correlate with use</u>		

There have been several studies conducted by independent scientists concerning the correlation of the dose-response relationship between the amount of drug taken and the amount measured in hair.

Dr. Werner Baumgartner et al. wrote in *Journal of Forensic Science*, November, 1989, "Another approach to testing our hypothesis was to investigate the correlation between the amount of self reported drug use and the drug content found in hair. Admittedly, self-reporting has its deficiencies; inaccuracies of recall, veracity of reporting, unknown drug purity and varying efficiencies of drug administration. In spite of these difficulties, we obtained reasonably good correlations between self-reports and the drug contents for cocaine, PCP and heroin."

Until more controlled studies are completed, one can only infer whether an individual may be a high, medium or low level user from the nanogram levels represented (see Exhibit 1).

References:

Baumgartner, W.A, Cheng, C.C., Donahue, T.D, Hayes, G.F, Hill, VA & Scholtz, H. Forensic Drug Testing by Hair Analysis, *J Forensic Sci*, 6,(1994).

Omega Laboratories, "The role of the medical review officer in hair testing" (2005).

www.parliament.uk/post Post Note No. 28

www.londontox.org.uk

www.wdtforum.org.uk laboratory guidelines for legally defensive work place drug testing (Urine)