

••• Ask the Expert

Q Why Use LC-MS/MS for the Analysis of Benzodiazepines and Opiates?

A

Benzodiazepines are the most widely used psychotropes in the world. This class of compounds used in combination with other psychotropes is quite often identified in cases of

death and drug-facilitated sexual assault. In the first case, the analyte concentrations in blood are relatively high and we therefore don't necessarily need highly sensitive analytical techniques. In most cases, HPLC (high performance liquid chromatography) coupled with DAD (Diode Array detection) provide enough sensitivity for forensic purposes. But in cases of drug-facilitated crimes, drugs are ingested in a single dose and at very low concentrations. Most of these compounds have a very short half-life time and are very quickly eliminated from the body. The elapsed times between the ingestion and the specimen sample collection is often long and therefore the blood samples taken are often performed very late timewise. For these reasons, blood and urine concentrations are very low, in the ng/ml range and sometimes even lower. In this case, immunoassays can't be used for sensitivity reasons and LC-MS/MS becomes the only technique that can be used to reach such low concentrations.

When the time between the ingestion and the sample taking is too long (over 3 days), it is nearly impossible to find psychotropes in urine or blood. The matrix of choice in this case in our laboratory becomes hair. The analysis of the hair one month after the ingestion is the only way to identify the drugs that may have been surreptitiously

given to a person. In that case we are talking about concentration in the pg/ml range. In our lab we have developed a method to identify 49 psychotropes used for drug facilitated crimes. Among the 49 psychotropes, we screen 27 benzodiazepines (metabolites and benzodiazepines like substances) with limit of quantitation going from 0.5 to 10 pg/ml depending of the molecules.

Natural opiates like morphine, 6 mono-acetyl morphine, methylmorphine (codeine), ethylmorphine (codethyline) can easily be analysed using GC-MS but synthesised opiates like fentanyl, sufentanyl that are used as drugs of abuse, and other drugs like buprenorphine, used in the treatment of opioid addiction are used at therapeutic level in most cases below 5ng/ml. This levels requires sensitive techniques for analysis like LC-MS/MS. Moreover, LC-MS/MS does not require any derivatization steps like we do with GC-MS and requires shorter sample preparation time.

For all these reasons, the LC-MS/MS is now the technique of choice in forensic laboratories for the analysis of opiates and benzodiazepines as soon as sensitivity and short response time is required. The LC-MS/MS technology is also widely used for its high specificity in case of complex matrixes analyses.

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