

Determination of ketamine in hair by thermal desorption-GC/MS

[Background] Ketamine (KET) is a main constituent of a recreational drug known as K powder. KET can elicit neurotoxic reactions and induce symptoms resembling schizophrenia. These symptoms include hallucinations, impaired motor function, risky behaviors, and profound impairment of memory and cognitive abilities. In drug abuse testing, hair stands out as an exceptional medium, offering unparalleled advantages. It enables comprehensive evaluation of the history, extent, and specific types of drug abuse. However, traditional analytical methods for detecting drugs in hair often require substantial sample quantities and the use of organic reagents, making the pretreatment process intricate. In this note, thermal desorption (TD)-GC/MS, which eliminates the need for laborious pretreatments, was applied for the determination of KET in human hair samples.

[Experimental] The analytical system consisted of a Multi-Shot Pyrolyzer (EGA/PY-3030D) coupled directly with a GC/MS system. A 0.30 mg aliquot of decontaminated hair was placed in a sample cup. The sample cup was first mounted on the waiting position of the pyrolyzer held at near room temperature, and then dropped into the heated center of the pyrolyzer furnace heated at 350 °C. Then the pyrolyzates were separated and analyzed by GC/MS.

[Results] A mass spectrum of a KET standard solution is shown in Fig. 1. The linearity ranged from 2 to 300 ng/mg for the spiked KET to hair with the correlation coefficient of 0.9987. The limit of detection was 0.7 ng/mg and limit of quantification was 2.0 ng/mg. The precisions (RSDs) ranged from 1.57 % to 7.75 % and the recovery ranged from 102.1 % to 110.9 %. A positive hair sample and a negative hair sample were successfully analyzed, as shown in Fig. 2. The results showed that the amount of KET was 22.3 ng/mg in the positive sample and less than 3.6 ng/mg in negative samples. Negative and positive hair samples could be identified easily by TD-GC/MS.

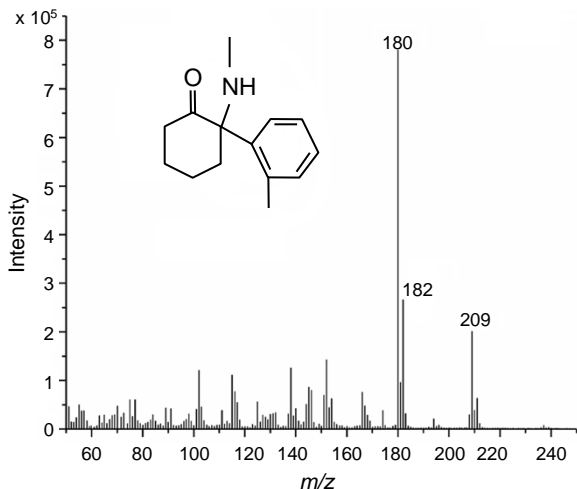


Fig. 1 Mass spectrum of a KET standard solution.

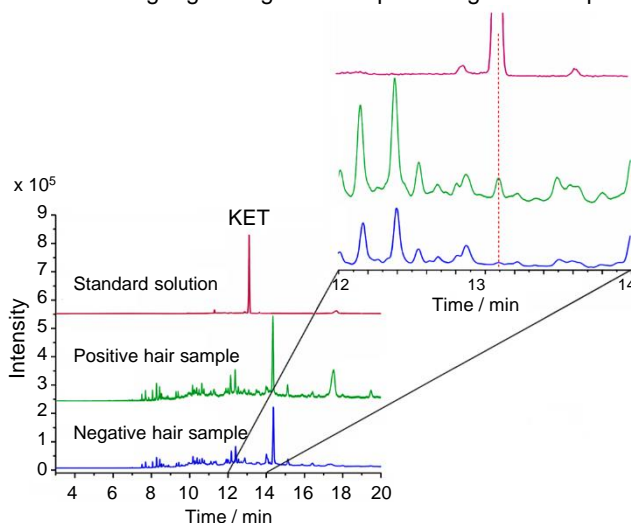


Fig. 2 TD chromatograms of a KET standard solution and positive/negative hair samples (EICs; m/z 180).

Pyrolyzer temp.: 350 °C; GC inlet temp.: 250 °C; GC oven temp.: 50 °C (20 °C/min) - 250 °C (10 min hold)
 Split ratio: 30:1; Separation column: DB-17MS (50 % diphenyl 50 % dimethylpolysiloxane), $L=30$ m, i.d.=0.25 mm, $df=0.25$ μ m,
 Carrier gas linear velocity: 36.3 cm/s (He) , M/S interface temp.: 250 °C; Ion source temp.: 230 °C; MS scan mode: SIM mode (m/z 180,182 and 209)

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Keywords : TD-GC/MS; Hair; K powder, Synthetic drug

Product used : Multi-functional pyrolyzer

Applications : Analysis of drugs in human hair

Related technical notes : [PYA2-034E](#), [PYA1-136E](#)

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