K3 The Distribution of 11-Nor-9-Carboxy-Tetrahydrocannabinol (THC-COOH) in Korean Drug Abusers' Hair

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After attending this presentation, attendees will better understand the recent trend of cannabis abuse in Korea and the distribution of THC-COOH in drug abusers' hair.

This presentation will impact the forensic science community by providing statistics of the distribution of THC-COOH in drug abusers' hair that help explain the current state of cannabis abuse of Korea via forensic toxicology.

Introduction: Cannabis is the second most commonly abused drug in Korea following methamphetamine. Δ^9-Tetrahydrocannabonol (THC) is the primary psychoactive constituent of cannabis. The metabolite of THC, 11-nor-9-carboxy-Δ^9-tetrahydrocannabinol (THCCOOH) can be detected in hair of cannabis users. The National Forensic Service (NFS) has performed THCCOOH analysis in the hair of drug abusers since November 2009; resulting in about 1,500 hair samples submitted every year for cannabis analysis to NFS. In this study, the distribution of THCCOOH in the head hair of Korean drug abusers during the years 2014 and 2015 was investigated.

Method: Possible contaminants on the surface of hair samples were eliminated by washing twice with 2mL methanol and distilled water, sequentially. Hair samples (about 20 mg) were then digested with 1M NaOH, extracted with mixed organic solvents (n-hexane:ethyl acetate), and subsequently analyzed by LC-MS/MS. THCCOOH-d_3 was used as internal standard. Identification and quantification of THCCOOH and THCCOOH-d_3 were made in multiple reaction monitoring (MRM) mode at m/z <u>245</u>, 191, and m/z <u>248</u>, respectively (quantifier ions are underlined). The limit of detection (LOD) was 0.05pg/mg and the limit of quantification (LOQ) was 0.10pg/mg.

Results: A total of 2,932 cases were submitted to NFS for cannabis analysis in hair (including body hair) of drug abusers from 2014 to 2015. Among them, 851 cases (30% of total cases) were positive for THCCOOH. The concentrations of THCCOOH in head hair (no. of cases=776, no. of segments=837) ranged from 0.10pg/mg to 235.9pg/mg (average=3.34pg/mg, median=1.05pg/mg). Of these cases, 746 cases (96%) were males and 30 cases (4%) were females between 16 and 68 years of age (average=42). Using statistical analyses, concentrations of THCCOOH in 776 samples of head hair were classified as low, medium, or high ranges (i.e., 0.10pg/mg-0.42pg/mg, 0.42pg/mg-3.25pg/mg, and 3.25pg/mg-235.9pg/mg, respectively). The concentrations of THCCOOH in both the head and pubic hair from the same individuals were compared in 15 cases. In 13 of these cases, the THCCOOH concentration in pubic hair was on average 5.3 times higher than that in head hair. Segmental analysis of each hair was performed at 3 cm intervals in 19 cases (with hair more than 9cm in length), and concentrations of THCCOOH gradually decreased from the root to the shaft in 12 cases.

Conclusions: Within the last two years, the detection rate of THCCOOH in the hair of drug abusers was as high as 30%, proving that cannabis abuse in Korea is just as serious as methamphetamine. Further investigation of the distribution of THCCOOH in hair will be useful in understanding patterns of cannabis abuse in Korean society.

THC-COOH, Hair Analysis, LC/MS/MS