



K46 Plasma Cannabinoid Concentrations in Daily Cannabis Users During Seven Days of Monitored Abstinence

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After attending this presentation, attendees will learn that Δ^9 -tetrahydrocannabinol (THC) plasma concentrations can exceed 0.25 ng/mL for more than seven days during monitored cannabis abstinence in daily cannabis users.

This presentation will impact the forensic community by influencing interpretation of plasma THC concentrations from daily cannabis users.

In the presence of corroborating evidence, detection of THC in whole blood at ≥ 2 ng/mL is commonly considered consistent with recent cannabis use in driving under the influence of drugs (DUID) cases and other forensic investigations. This laboratory has previously reported detectable THC in plasma (≥ 0.5 ng/mL) 3 to 27 hr after smoking a single 1.75 or 3.55% THC cigarette, while the inactive metabolite, 11-nor- Δ^9 -tetrahydrocannabinol-9-carboxylic acid (THCCOOH) was detected at 0.5 ng/mL for 48 to > 168 hr. Few data are available on analyte detection in plasma of daily cannabis users during periods of monitored abstinence.

Twenty-eight, self-reported daily cannabis users (ages 19-36, 46.4% male, 85.7% African American) provided written informed consent for this IRB-approved study, where they resided in a closed clinical research unit for 7 days. Plasma specimens were collected upon admission and once every 24 hr thereafter. Cannabinoids were extracted by solid phase extraction (SPE) using ZSTHC020 columns (United Chemical Technologies, Inc., Bristol, PA) and derivatized with *N,O*-bis-(trimethylsilyl)trifluoroacetamide + 1% trimethyl-chlorosilane (BSTFA + 1% TMCS). Derivatized extracts were injected into an Agilent 6890 gas chromatograph (GC)/5973 mass selective detector (MSD) system operated in electron impact (EI)/selected ion monitoring (SIM) mode. A two dimensional GC method with cryofocusing was developed and validated for the quantification of THC, 11-OH-THC, and THCCOOH. Split calibration curves (low, 0.125 – 25 and high, 25 – 100 ng/mL) were constructed with $r^2 > 0.99$. Limits of quantification (LOQ) were 0.25 ng/mL for all analytes.

After more than 16 hr of monitored abstinence, 92.6% of participant plasma specimens (N = 27) were positive for THC (≥ 0.25 ng/mL). On Days 3, 4, 5, 6, and 7, 84.6 (N = 26), 79.2 (N = 24), 70.8 (N = 24), 66.7 (N = 24), and 76.0% (N = 25) of participant plasma specimens contained detectable THC, respectively. Not all participants had adequate specimen volume on all days.

Of the 19 participants' plasma specimens testing positive for THC on day 7 (≥ 0.25 ng/mL), 9 tested positive with an LOQ of 1 ng/mL, while 4 were positive using a 2 ng/mL LOQ.

Sixteen participants' plasma specimens had detectable THC on days 2, 4, and 7; median concentrations were 1.6 (range 0.8 - 7.3), 1.4 (range 0.5 - 7.5), and 1.2 (range 0.3 - 5.5) ng/mL, respectively. Fewer specimens were positive for 11-OH-THC; median concentrations were 2.4 (N = 3, range 2.1 – 3.3), 1.2 (N = 2, range 0.73 – 1.75) ng/mL, and not detected (N = 16) on average, in most of the cases. In some instances the trooper saw the disposal days 2, 4, and 7, respectively. Median THCCOOH concentrations in these 16 participants' specimens were 25.9 (range 7.2 – 189.4), 19.4 (range 4.3 – 88.3), and 11.5 (range 2.8 – 45.6) ng/mL, on days 2, 4 and 7, respectively.

Interpretation of plasma and whole blood cannabinoid concentrations is important in DUID and other forensic cases. For the first time, we present evidence of the presence of THC in plasma for multiple days during monitored abstinence, suggesting that its detection in plasma may not indicate recent use in individuals consuming cannabis on a daily basis. Bioaccumulation of THC in deep tissue compartments and gradual release from tissue stores into the bloodstream during cannabis abstinence may explain this prolonged seven day THC detection window.

THC, Plasma, Cannabis