K42 Cannabinoid Concentrations in Daily Cannabis Smokers' Oral Fluid During Prolonged Monitored Abstinence

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After attending this presentation, attendees will: (1) be able to characterize THC and metabolite oral fluid disposition in daily cannabis smokers during monitored abstinence; and, (2) will be able to understand cannabinoid oral fluid detection windows for interpretation of oral fluid cannabinoid results.

This presentation will impact the forensic science community by improving the interpretation of oral fluid test results from chronic, daily cannabis smokers.

Introduction: Oral fluid is an increasingly popular alternative matrix for drug treatment, workplace, and driving under the influence of drugs testing programs due to ease of collection and reduced opportunity for specimen adulteration. The National Highway and Safety Administration's 2007 National Roadside Survey reported that more than 14% of nighttime drivers' oral fluid tested positive for potentially impairing drugs; Δ^9-tetrahydrocannabinol (THC), the primary psychoactive component of cannabis, was the most commonly detected drug at 6.1%. Drug presence does not necessarily imply impairment, as THC and metabolites were detected in chronic cannabis smokers' plasma for up to seven days during monitored abstinence.

Methods: Healthy male daily cannabis smokers provided written informed consent to participate in this IRB-approved study. Participants resided on a closed research unit with continuous monitoring for up to 31 days. Oral fluid specimens were collected once each 24 h with the Quantisal™ collection device, and analyzed for THC, cannabidiol (CBD), cannabinol (CBN), and 11-nor-9-carboxy-THC (THCCOOH) by two-dimensional (2D) GCMS. Limits of quantification (LOQ) were 0.5 ng/mL for THC and CBD, 1 ng/mL for CBN (electron impact 2D- GCMS), and 7.5 pg/mL for THCCOOH (negative chemical ionization 2D-GCMS).

Results: Seventeen cannabis smokers (19-43 years old) reported current smoking of 1-18 joints/day (median 9 joints/day), and up to 45 joints/day during peak use. Participants resided on the closed residential unit for 5 to 31 days. Cannabinoids were quantified in 304 oral fluid specimens. Maximum THC, CBD, and CBN concentrations occurred upon admission, while THCCOOH concentrations generally peaked within the first two days of abstinence. All specimens from one subject who spent 30 days on the research unit were below LOQ; however, self- report data indicated only 1 joint/day typical use. THC was quantifiable in only 26 specimens (8.6%) at concentrations <82.5 ng/mL, and was never present without concurrent THCCOOH. Daily THC detection rates in Quantisal™ collected oral fluid decreased from 94 to 41 to 18% during the first, second and third days of abstinence, with no THC detectable after this time. Of the specimens 6.6% were THC-positive at the recommended DRUID confirmation cutoff of 1 ng/mL and 5.3% at the proposed Substance Abuse and Mental Health Services Administration 2 ng/mL cutoff. THCCOOH detection in oral fluid was prolonged, with concentrations up to 202.5 pg/mL in 141 specimens (46.4%). All 17 participants resided on the secure research unit for at least five days, with 81.6% of daily THCCOOH concentrations ≥LOQ. During the first, second and third weeks of abstinence, 74.6, 41.3, and 29.6% of specimens were THCCOOH positive. For the 61 specimens collected on days 22-31, 14.8% remained ≥7.5 pg/mL. CBD (initial concentrations 2.6 - 3.4 ng/mL) and CBN (1.1 - 5.2 ng/mL) were only detectable on the first day in oral fluid from two and eleven subjects, respectively.

Conclusions: THC and THCCOOH were detected in oral fluid of chronic, daily cannabis smokers during monitored abstinence for 3 and 30 days, respectively. The differences in detection windows may be attributed to the much lower LOQ for THCCOOH. For the first time, it is documented that detection of cannabinoids in oral fluid of daily cannabis smokers may not reflect recent use and may not indicate impairment in daily chronic cannabis smokers. Neurocognitive impairment in daily chronic cannabis smokers was demonstrated on some measures for 7 to 28 days. Additional research is needed to determine if cognitive and performance impairment persists during the detection window of cannabinoids in oral fluid. It is hypothesized that residual THC in the brain produces the performance impairment observed in chronic daily cannabis smokers. These novel cannabinoid oral fluid data are important for interpreting oral fluid test results.

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