K46 Blood and Oral Fluid Cannabinoids' Pharmacokinetics and the Evaluation of Two On-Site Oral Fluid (OF) Screening Devices for the Prediction of Δ^9-Tetrahydrocannabinol (THC) in Oral Fluid and Blood Following Edible Cannabis Administration

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After attending this presentation, attendees will understand the relationship between blood and OF THC pharmacokinetics following controlled edible cannabis administration to frequent and occasional cannabis smokers. Additionally, attendees will understand the utility of on-site OF screening devices for predicting the presence of THC in OF and blood.

This presentation will impact the forensic science community by filling an important knowledge gap in cannabinoid pharmacokinetics following ingestion of cannabis-containing edibles and by improving interpretation of screening and confirmatory cannabinoid tests.

OF is an attractive testing matrix for driving under the influence of drugs settings. Its utility on the roadside is increased with on-site screening devices. In addition to testing for the presence of OF THC, on-site results may help predict THC in blood. This was previously demonstrated with specimens collected roadside and following controlled inhaled cannabis, but never following edible cannabis. To properly interpret test results, additional characterization of the relationship between blood and OF cannabinoid pharmacokinetics following ingestion of cannabis-containing edibles is required.

Nine frequent (≥5x/week) and seven occasional (≥2x/month, but <3x/week) cannabis smokers provided written informed consent to participate in this National Institute on Drug Abuse Institutional Review Board, Food and Drug Administration (FDA), and Drug Enforcement Administration (DEA) -approved study. On the morning of dosing, participants consumed a cannabis-containing brownie (6.9% THC, ~50.1mg) in 10min. Blood and OF were collected before and up to 48h post-dose and analyzed for THC. Confirmatory OF specimens were collected with the Quantisal™ device. The Draeger DrugTest® 5000 (DT5000) or Alere™ DDS®2 (DDS2) on-site screening devices were randomly assigned to individual participants. OF specimens were collected for 5min or until the volume-adequacy indicator turned blue. Pharmacokinetic differences between smoking groups were evaluated by independent samples *t*-tests (two-tailed $p < 0.05$ significance threshold). OF/blood THC ratios were calculated for all paired samples when analytes ≥ limit of quantification (0.5µg/L blood, 0.2µg/L OF). Effects of time and smoking group on observed OF/blood THC ratios were evaluated by repeated measures analysis of variance; post hoc tests were conducted with a Bonferroni correction. For on-site device performance evaluation, qualitative DT5000 and DDS2 results were compared to quantitative OF and blood THC results at various confirmatory cutoffs and sensitivity, specificity, and efficiency were determined.

There were no significant differences in mean (range) OF THC maximum concentrations (C_{max}) between frequent (573 (39.3-2,111) µg/L) and occasional (362 (115-696) µg/L) cannabis users, or in time of C_{max} (t_{max}, 0.33h); however, there was a significant difference in time of last positive (t_{last}) THC OF results between frequent

(39 (20->48) h) and occasional (23 (20-26) h) users. Significant differences in blood THC C_{max} between frequent (17.7 (8.0-36.1) µg/L) and occasional (8.2 (3.2-14.3) µg/L) users, and in t_{last} (>48h and 17 (8.0-38.0) h, respectively) were observed. OF/blood THC ratios were initially large and variable 0.5h post-dose, and concentrations were not significantly correlated. Ratios from 1h to 5h post-dose were significantly smaller than those at 0.5h. Performance criteria for the DT5000 and DDS2 were >80% overall (both groups) with a confirmatory OF THC cutoff ≥5µg/L; no true positive result was observed by 8h with either device at this cutoff. Performance criteria were >80% with a blood THC ≥5µg/L cutoff for occasional smokers with the DT5000 and for frequent smokers with the DDS2.

Differences observed between blood and OF THC pharmacokinetics (partially due to initially large oromucosal contamination) contribute to the lack of a significant correlation within the first 5h after oral cannabis. While a reliable conversion between blood and OF THC concentrations does not exist, OF can predict the presence of THC in blood. These data will aid and improve cannabinoid screening and result interpretations.

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Oral Fluid/Blood THC Ratios, Oral Fluid Screening, Edibles