K63 Cannabinoid Disposition in Oral Fluid After Controlled Cannabis Vaporizer Administration

Rebecca L. Hartman, BA, 251 Bayview Boulevard, Ste 200, Rm 05A721, Baltimore, MD 21224; Moonhee Jang, PhD, National Forensic Service, 331-1 Sinwol-7-dong, Yangcheon-gu, Seoul 158-707, SOUTH KOREA; Andrew L. Spurgin, PharmD, National Advanced Driving Simulator, 2401 Oakdale Boulevard, Iowa City, IA 52242; Keming Yun, PhD, Shanxi Medical University, School of Forensic Medicine, 56 Xinjian South Street, Taiyuan, Shanxi, CHINA; David A. Gorelick, MD, PhD, University of Maryland, Dept of Psychiatry, PO Box 21247, MPRC-Tawes Bldg, Baltimore, MD 21228; Gary Milavetz, PharmD, University of Iowa, College of Pharmacy, S419 PHAR, 115 Grand Avenue, Iowa City, IA 52242; Timothy L. Brown, PhD, University of Iowa, National Advanced Driving Simulator, 2401 Oakdale Boulevard, Iowa City, IA 52242; Gary Gaffney, MD, University of Iowa, Carver College of Medicine, 1874 John Pappajohn Pavilion, Iowa City, IA 52242; and Marilyn A. Huestis, PhD, Chemistry & Drug Metabolism, Intramural Research, NIDA, NIH, 251 Bayview Boulevard, Rm 05A721, Baltimore, MD 21224*

After attending this presentation, attendees will better understand cannabinoid disposition in Oral Fluid (OF) following cannabis vaporization.

This presentation will impact the forensic science community by providing a framework for interpreting OF cannabinoid concentrations after vaporization.

Background: Cannabis is the most prevalent illicit drug worldwide. OF is an advantageous sampling matrix for drug screening due to ease of observed collection, non-invasiveness, and ability to collect and analyze onsite. Limited data exist for cannabinoid disposition following vaporization, a common alternative to smoking.

Hypothesis: OF THC, CBD, and CBN maximum concentrations will occur immediately post-inhalation and decrease rapidly. CBD and CBN will appear in lower concentrations than THC. When THCCOOH is detected, it will be in low concentrations, with maximum concentration later in the time course.

Methods: Current occasional (≥1x/last 3 months, ≤3 days/wk) cannabis smokers provided written informed consent and OF specimens for this Institutional Review Board-approved controlled cannabis administration study. Participants inhaled 500mg placebo, low (2.9%)-Δ^9-tetrahydrocannabinol (THC), or high (6.7%)-THC cannabis in separate sessions in a randomized within-subject design. OF specimens were collected with the Quantisal™ collection device prior to and 0.17, 1.4, 2.3, 3.3, 4.3, 5.3, 6.3, 7.3, and 8.3h post-dose. Specimens were quantified for THC, 11-nor-9-carboxy-THC (THCCOOH), cannabidiol, and cannabinol (limits of quantification 0.5µg/L, 15ng/L, 1µg/, and µg/L, respectively). Maximum concentration (C_{max}), time to C_{max} (t_{max}), and time of last detection (t_{last}) were determined and area under the curve from baseline to 8.3h ($AUC_{0\text{-}8.3h}$) calculated by the linear trapezoidal method. Within-subjects medians were compared with the Wilcoxon Matched-Pairs Test.

Results: Median (range) C_{max}, t_{max}, t_{last}, and $AUC_{0\text{-}8.3h}$ from 28 participants (19M, 9F, ages 21-40 years) are presented in the table. Significant differences ($p<0.05$) were detected [a]placebo vs. low, [b]placebo vs. high, and [c]low vs. high, as indicated.

		THC	THCCOOH	CBD	CBN
Placebo	C_{max}, µg/L (ng/L, THCCOOH)	4.7[a,b] (0-25.9)	0[a,b] (0-361)	0[a,b] (0-1.7)	0[a,b] (0-1.9)
	t_{max}, h	0.17 (0.17-1.4)	2.3 (0.17-≥8.3)	0.17 (0.17-0.17)	0.17 (0.17-0.17)
	t_{last}, h	6.3[a,b] (1.4-≥8.3)	≥8.3 (5.3-≥8.3)	0.17 (0.17-0.17)	0.17 (0.17-0.17)
	$AUC_{0\text{-}8.3h}$, h*µg/L (h*ng/L, THCCOOH)	6.6[a,b] (0-56.1)	0[a,b] (0-1941)	0[a,b] (0-1.4)	0[a,b] (0-1.39)

Low	C_{max}, µg/L (ng/L, THCCOOH)	848[a] (16.3-18230)	24.1[a] (0-686)	6.0[a,c] (0-100)	54.4[a] (1.2-941)
	t_{max}, h	0.17 (0.17-0.17)	3.3 (0.17-≥8.3)	0.17 (0.17-0.17)	0.17 (0.17-0.17)
	t_{last}, h	≥8.3[a] (2.3-≥8.3)	≥8.3 (0.17-≥8.3)	0.17[c] (0.17-2.3)	2.3 (0.17-7.3)
	$AUC_{0\text{-}8.3h}$, h*µg/L (h*ng/L, THCCOOH)	723[a] (13.9-3865)	42.9[a] (0-2935)	3.1[a,c] (0-79.0)	44.1[a] (0.85-246)
High	C_{max}, µg/L (ng/L, THCCOOH)	862[b] (25.1-23680)	18.6[b] (0-464)	34.7[b,c] (1-1106)	32[b] (0-766)
	t_{max}, h	0.17 (0.17-3.3)	2.8 (0.17-6.3)	0.17 (0.17-3.3)	0.17 (0.17-3.3)
	t_{last}, h	≥8.3[b] (6.3-≥8.3)	≥8.3 (0.17-≥8.3)	2.3[c] (0.17-≥8.3)	2.3 (0.17-≥8.3)
	$AUC_{0\text{-}8.3h}$, h*µg/L (h*ng/L, THCCOOH)	934[b] (38.4-19090)	66.2[b] (0-2181)	32.0[b,c] (0.72-912)	28.9[b] (0-617)

Conclusion: OF THC concentrations after vaporization are comparable to previously-published smoking data. THC, THCCOOH, and CBN did not show any statistically significant low vs. high dose differences, suggesting participants were able to titrate dose by adjusting inhalation topography, similar to smoking behavior. When present, OF THCCOOH has low concentrations compared to the other analytes; in some occasional smokers, THCCOOH was not detected in OF even after the high dose. OF THCCOOH (if detected) was suggested to help differentiate active vs. passive cannabis exposure. This presentation will impact the forensic community by providing a framework for interpreting OF cannabinoid concentrations after vaporization.

Research was supported by the NIDA/NIH Intramural Research Program, NHTSA, and ONDCP.

Cannabis, Vaporizer, Oral Fluid