K29 Motor Vehicle Passive Cannabis Smoke Exposure and Intercept® Oral Fluid Testing

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The goal of this study was to determine if extreme passive exposure to cannabis smoke in a motor vehicle would produce positive results for delta-9-tetrahydrocannabinol (THC) in oral fluid tests.

"Passive cannabis smoke exposure" is an explanation offered by cannabis users for positive urine tests conducted in workplace programs. This defence has not been reported in more than 15,000 oral fluid positive cannabis tests in workplace programs, but might be attempted. This presentation will impact the forensic community and/or humanity by providing results from this study that demonstrate that such claims have no scientific basis absent the extreme conditions described. This information is essential in interpretation of oral fluid tests by forensic toxicologists and Medical Review Officers.

The objective of this study was to determine if extreme passive exposure to cannabis smoke in a motor vehicle would produce positive results for delta-9-tetrahydrocannabinol (THC) in oral fluid tests.

Passive exposure to cannabis smoke in an unventilated room has been shown to produce a transient appearance of THC in oral fluid for up to 30 minutes (1,2). However, it is well known that such factors as room size, ventilation conditions, and extent of smoke exposure can affect outcome results.

The authors conducted a passive cannabis study under extremely severe passive smoke exposure conditions in an eight-passenger van. The van had an approximate interior volume of 15.3 cubic meters. Four experienced, male cannabis users each smoked a single cannabis cigarette (mean 5.4 %THC) while seated inside the closed van in the presence of four passive, drug-free, male non-smokers. There were four rows of seats in the van; one cannabis smoker sat on each row alongside one passive subject. Cannabis cigarettes were lighted by the cannabis smokers in the van and smoked for approximately 20 minutes to completion. All doors and windows were closed and the van was turned off, providing no ventilation. After the completion of cannabis smoking, all participants remained in the closed, unventilated van for an additional 60 minutes.

Oral fluid specimens were collected with the Intercept® Oral Specimen Collection Device (OraSure Technologies, Bethlehem, PA) according to manufacturer's instructions. Oral fluid collections were made inside the van for the first 45 minutes. Participants were allowed outside the van after 60 minutes where specimen collection continued. Bilateral oral fluid collections (left and right side of the mouth) were made from all subjects at the following times: baseline; 0 (immediately at the end of smoking); 15, 30, 45 minutes inside the van, and 1; 1.25; 1.5; 1.75; 2; 2.5; 3; 3.5; 4; 6; and 8 hours outside of the van, and from passive subjects only at 10; 12; 24; 36; 48; 60; and 72 hours.

Oral fluid specimens were analyzed with the Cannabinoids Intercept® MICRO-PLATE Enzyme Immunoassay by OraSure Technologies (Bethlehem, PA) following manufacturer's procedures. Quantitative analysis of THC in oral fluid specimens was performed by GC-MS-MS. THC concentrations were adjusted for dilution (X3) and are reported as estimated neat oral fluid concentration. The screening and confirmation cut-off concentrations for THC in neat oral fluid were 3 ng/mL and 1.5 ng/mL, respectively. The LOD/LOQs for THC in the GC-MS-MS assay were 0.3/0.75 ng/mL.

Screening and GC-MS-MS results for the bilateral (simultaneous) oral fluid collections are shown side-by-side in Table I. Only results for specimens that tested positive in screening or GC-MS-MS were tabulated. The remaining oral fluid specimens collected from one through 72 hours tested negative in screening and confirmation with the exception of one specimen that appeared to be contaminated during handling of the Intercept collection device. The apparent contaminated specimen, collected at 2.5 hours by PASSIVE #C, screened positive and confirmed with a THC concentration of 3.0 ng/mL. The accompanying bilateral specimen collected simultaneously with the contaminated specimen screened negative and was negative for THC by GC-MS-MS at LOD.

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Table I. THC Oral Fluid Screening (cutoff = 3 ng/mL) and Confirmation (cutoff = 1.5 ng/mL) Results for Passively Exposed Subjects (two specimens per time point, collected bilaterally).

Minutes	PASSIVE #A THC Screen	PASSIVE #A GC-MS-MS ng/mL	PASSIVE #B THC Screen	PASSIVE #B GC-MS-MS ng/mL	PASSIVE #C THC Screen	PASSIVE #C GC-MS-MS ng/mL	PASSIVE #D THC Screen	PASSIVE #D GC-MS-MS ng/mL	Mean GC-MS-MS (SEM), ng/mL
0	+/+	4.8/3.6	+/+	6.0/7.5	+/+	6.6/5.1	+/+	3.9/4.5	5.3/5.2 (0.6/0.8)
15	+/+	4.2/6.0	-/-	2.7/2.8	-/-	<1.5/1.8	+/+	3.9/2.3	3.6/3.2 (0.4/0.9)
30	-/+	3.3/4.8	-/-	2.4/1.6	+/-	3.0/<1.5	+/-	2.8/2.9	2.9/3.1 (0.2/0.8)
45	-/-	2.0/1.7	-/-	<1.5/<1.5	-/-	<1.5/<1.5	-/-	<1.5/2.6	2.0/2.1 (NA/0.3)

This study confirms and extends earlier findings (1,2) on the effects of passive exposure to cannabis smoke on oral fluid results. The risk of a positive test result in screening and confirmation for THC was limited to 30 minutes or less following passive cannabis smoke exposure under extreme environmental conditions.

The extreme nature of the conditions employed in this passive cannabis smoke study is worthy of comment. Each passively exposed subject remained seated alongside a cannabis smoker during the hour of passive smoke exposure inside the van. The cannabis smokers smoked cannabis cigarettes to completion. The van doors and windows remained closed throughout the study and the van was turned off, providing no ventilation. Oral fluid collections were made for the first 45 minutes inside the van in the presence of cannabis smoke further increasing the risk of environmental contamination during collection. Given the extreme nature of the conditions employed in this study, it is concluded that the risk of positive oral fluid tests from passive cannabis smoke exposure would not occur under realistic conditions.

References:

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Cannabis, Passive Exposure, Oral Fluid

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