Overview of Oral Fluid Testing

Oral fluid (OF) tests detect THC and other drugs that are exuded from the body into the saliva after having taken the drug. The profile of THC in oral fluid is similar to that of blood, spiking at high levels (~ 100s ng/ml) early on then falling to lower levels that remain detectable (> 0.5 ng) for hours or days after use. Residual THC left in the mouth by smoke particles may elevate oral fluid levels in the first few minutes after use, but are cleared in 30-60 min. and don't affect the longer term residual tail detected by the tests. [Bosker & Huestis]

Detection time. Lab studies commonly report the detection of THC in OF for 48 hours or more after smoking at sensitivities of 0.5 ng/ml. The metabolite THC-COOH can be detected for days longer in OF, just like in urine, but is not generally used for DUID screening. CBD and CBN can also be detected.

KEY STUDIES (full text available on request)

Niedbala et al (2001) (Orasure Technologies,PA): Oral fluid specimens tested positive following smoked marijuana (N=10) consecutively for average periods of 13 - 15 hours (depending on testing method) after smoking one joint containing 20-25 mg THC. Average THC detection time of the last OF positive after smoking was 31 – 34 hours. Some samples were positive at 72 hours at levels ≤1.2 ng.

Odell et al (Australia): Tested 21 heavy users diagnosed as cannabis "dependent" for 7 consecutive days. THC was detectable in OF up to 78 hours. Mean detection time was on the order of 24 hours.

Dayong Lee et al (Johns Hopkins): Examined 28 regular smokers during monitored abstinence of 4 to 33 days. Mean THC detection rates decreased from 89.3% at admission to 17.9% after 48 hours. Though 11 subjects were clear by the second day, two subjects surprisingly tested positive after 28 days and another after 18 days, raising doubts whether they cheated on the monitored abstinence.

Newmeyer et al (NIDA): Tested 14 heavy and 10 occasional users with the Oral-Eze® device for multiple cannabinoids over 30 hours. THC was detected at levels ≥ 0.5 ng in all smokers after 13.5 hours and in 62% of frequent users and 40% of occasional users at 28 hours. The joints, which came from NIDA, had measurable traces of CBD and CBN, which were detected for 4-10 hours. THC-COOH metabolite was detectable the whole time in chronic users, but tailed off in occasional ones after 8 hours.

Ramaekers et al (Holland): 20 subjects were subjected to medium, strong, and placebo doses. Their performance on three motor and cognitive skills tests was measured at regular intervals over 6 hours along with THC levels in plasma and OF. Performance was negatively affected by high THC levels, but associated correlations were low ~ 0.15-0.40. QUOTE from abstract: "Results showed a strong and linear relation between THC in serum and oral fluid. Linear relations between the magnitude of performance impairment and THC in oral fluid and serum, however, were low."

Cutoff thresholds: While lab studies are typically sensitive to 0.5 ng/ml, detection times can be reduced by setting a higher cutoff threshold. SAMHSA has proposed a screening cutoff of ≥ 4 ng/ml for workplace OF testing. Two cutoffs commonly proposed for roadside DUI tests are 5 ng (available from Dräger) and 25 ng, used by Spanish police. See Figure 3 below from A de Castro et al. on the sensitivity of tests at 1, 5 and 25 ng for periods of 3-24 hr after smoking (© *Drug Testing and Analysis*, Oct 2014). Newmeyer et al. observed: "Short last detection times ... were obtained when CBD or CBN was added to a THC ≥1µg/L [cut-off]; this cut-off may be useful for DUID and accident investigations because the median last detection times fall within reported acute impairment windows." However, this would probably not have been the case had the subjects been given high-CBD cannabis.

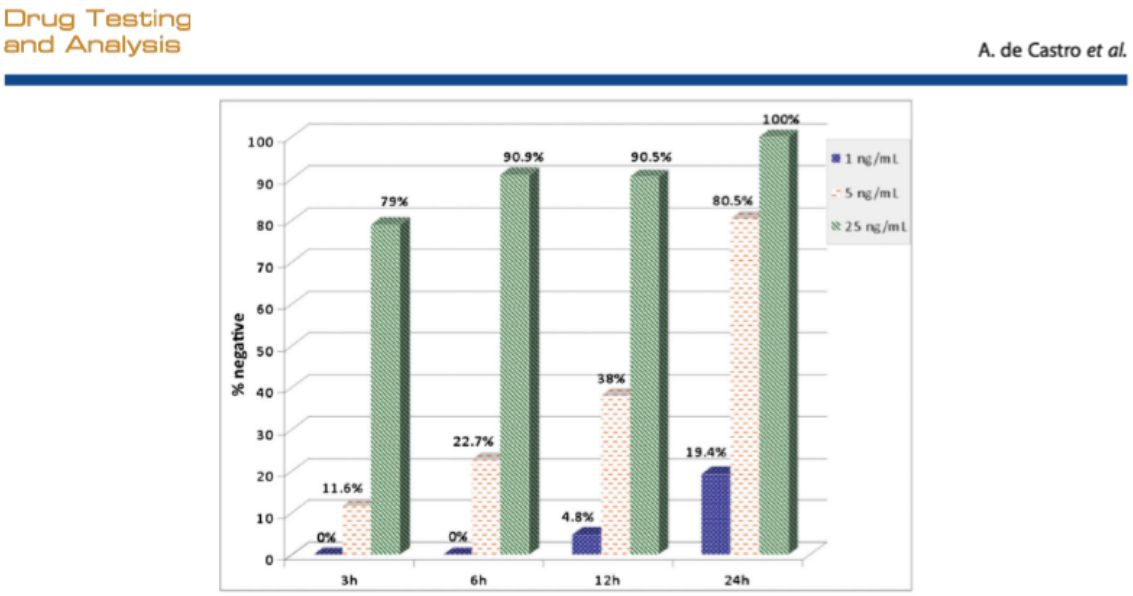

Figure 3. %Negative specimens 3, 6, 12 and 24 h post-dosing, depending on THC oral fluid cut-off employed (1, 5 or 25 ng/mL).

Edibles & oral consumption: OF testing appears to be relatively insensitive to orally ingested cannabis. Milman et al. administered 57 round-the-clock Marinol doses of 20 mg to ten subjects over 9 days. THC was detected in only 20.7% of OF samples, with highest concentrations near admission from previously self-administered smoked cannabis. Niedbala et al. found only low levels of THC in three subjects given a marijuana brownie, with maxima of 2.2 ng, 7.1 ng, and 5.6 ng occurring 1-2 hours after ingestion.

Passive exposure to MJ smoke was found to produce transient positives in oral fluid for up to 30-45 minutes, with a peak level of 7.2 ng/ml (Niedbala 2005). De Castro et al. reported positives from passive exposure at levels ≤ 24.6 ng one hour after the test. This might potentially be significant in some DUI cases.

Mouthwashes have only a marginal effect on oral fluid THC. In a study by de Castro et al. 11 chronic users were tested after rinsing their mouths with water, milk, or Kleaner® mouthwash. Statistically significant reductions in OF THC were found in a few instances where subjects used water, but not enough to affect whether they were under or over the cutoff used by Spanish police (25 ng/ml). Effects of the mouthwash were noticeable only in the first hour after exposure, suggesting that it removed some residual THC left in the oral cavity by smoking, but not THC exuded into it later by the body.

Validation: Several studies have looked at the accuracy of portable OF tests compared to more sensitive laboratory GCMS tests. A study by Logan et al. looked at two tests under consideration by the state of California: the Dräger® DDT 5000 and the Alere® DDS2 Mobile System. The former was found to be 78% sensitive to the presence of drugs, while the latter was 70.6% No false positives to THC were observed. However, another study of the Dräger 5000 by Fierro et al. found that the device underestimated the percentage of drivers using cannabis, missing four out of five drivers with THC concentrations > 27 ng/ml. Another study by Gentili et al. of the DrugWipe 5A ® found the device was 50-67% sensitive to cocaine and opiates, while "both sensitivity and accuracy were unsuccessful (29 and 53% resp.) for cannabis, underlying the limitation of the device for this latter drug class."

In a Feb. 3, 2016 press release, Dräger announced that OF drug test results from its DT 5000 mobile screening system were found to be scientifically reliable in a Kelly-Frye hearing for a vehicular manslaughter case in California, "The People of the State of California v. Junior Salas" (Kern Co. Superior Court, Bakersfield, case #BF153631A).

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Compiled by Dale Gieringer, Cal NORML – dale@canorml.org (510) 540-1066