K29 Δ-9-Tetrahydrocannabinol (THC) Concentrations in Drivers Testing Positive for Marijuana Use and Consequences for the Effectiveness of a THC *Per Se* Law

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After attending this presentation, attendees will be able to describe patterns of combined drug and alcohol use in drivers testing positive for marijuana use, and assess the likely effectiveness of *per se* thresholds for delta-9-tetrahydrocannabinol (THC) in blood samples in Driving Under the Influence of Drugs (DUID) cases.

This presentation will impact the forensic science community by providing information about: (1) the impact of setting arbitrary *per se* thresholds for drugs like THC with rapidly changing pharmacokinetic profiles; and (2) on the effectiveness of *per se* laws governing DUID.

This study was undertaken to assess the typical range of THC concentrations in blood samples submitted in DUID investigations relative to the *per se* concentration thresholds in various U.S. states.

These results were obtained from blood samples submitted to the laboratory for confirmatory testing for marijuana use in DUID cases between August 2009 and June 2013, after having screened positive by a cannabinoid Enzyme-Linked Immunosorbent Assay (ELISA). Cases were analyzed for delta-9-tetrahydrocannabinol (THC, cut off 1ng/mL), 11-OH-delta-9-tetrahydrocannabinol (THC-OH, cut-off 5ng/mL), and 11-carboxy-delta-9-tetrahydrocannabinol (THC-COOH, cutoff 5ng/mL), using three-dimensional gas chromatography-mass spectrometry.

A total of 3,814 cases tested positive for THC above 1ng/mL, and were additionally tested for alcohol by Headspace Gas Chromatography with Flame Ionization Detection (HS-GC/FID) and for other drug classes (benzodiazepines, opiates, cocaine metabolite, amphetamines, methadone, phencyclidine, barbiturates, and propoxyphene) by ELISA. These cases were categorized as follows: (1) positive for THC with other drugs and alcohol present (>0.01) (n=558; 14.6%); (2) positive for THC without other drugs but with alcohol present (>0.01) (n=1,625; 42.6%); (3) positive for THC with other drugs detected but no alcohol (n=619; 16.2%); and, (4) positive for THC with no other drugs or alcohol present (n=1,012; 26.5%). In summary, 30.8% were positive for other drug use in addition to THC, while 57.2% were positive for alcohol use in addition to THC.

Within these groups, cases were evaluated as to whether the THC concentration exceeded certain thresholds, specifically, the 2ng/mL *per se* threshold applied in Ohio and Nevada, and the 5ng/mL threshold applied in Colorado and Washington state.

Table 1: Distribution of THC Concentration values at key *per se* thresholds by alcohol/other drug status. All cases were positive for THC at a concentration of 1.0 or greater.

	n	Median THC concentration (ng/mL)	1 – 1.9ng/mL (Below per se threshold in OH, NV)	1-4.9ng/mL (Below per se threshold in WA/CO)
All THC Positive cases with Alcohol and Drug results	3,814	3.8	24.2%	62.8%
THC +; Alcohol +; Other Drug +	558	2.8	33.5%	73.6%
THC +; Alcohol +; Other Drug -	1625	3.1	27.5%	70.1%
THC +; Alcohol - ; Other Drug +	619	3.7	25.7%	61.7%
THC +; Alcohol - ; Other Drug -	1012	5.6	12.8%	45.6%

The data demonstrate that a significant proportion of all drivers tested (24.2%) had blood THC concentrations below the *per se* thresholds in Ohio and Nevada, while 62.8% had concentrations below the *per se* thresholds in Washington and Colorado. Broken down further by the drivers' alcohol and other drug use status, cases where THC was the only drug present and the most likely cause for the observed impairment had the smallest proportion of drivers under the 5ng/mL *per se* threshold (45.6%) and the highest median THC concentration (5.6ng/mL). Cases with both alcohol and other drugs present where not all the observed impairment can be attributed to THC, had the lowest median THC concentration (2.8ng/mL) and the highest proportion of drivers who would escape the 5ng/mL *per se* prosecution at 73.6%. Cases with THC and alcohol only, or cases with THC and other drugs only, fell in between these two extremes.

The application of 5ng/mL *per se* laws for THC in drivers risks excluding a high number of drivers whose blood THC concentrations will fall below the *per se* threshold during the 1-2 hours it takes to collect a blood sample following the stop, investigation, and arrest.

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Officials in jurisdictions with 5ng/mL *per se* or presumptive concentration thresholds in their statutes for THC should give significant consideration to objective evidence of impairment and presence of symptoms associated with marijuana use, rather than relying solely on blood THC concentrations that fall below these arbitrary thresholds when determining whether a subject is under the influence as a result of their marijuana use.

Marijuana, DUID, Per Se Laws

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