



Backgrounder

The Science Behind I-502's Per Se Standard

Initiative 502 establishes a new DUI “per se” limit of 5 nanograms of active delta-9-tetrahydrocannabinol (THC) per milliliter of whole blood* (5 ng/mL).

- “Significant performance impairment emerges at serum THC concentrations >2 ng/mL [1 ng/mL in whole blood] and **crash risk significantly increases at serum THC concentrations between 4-10 ng/mL [2-5 ng/mL in whole blood].**” Ramaekers, J. G., Berghaus, G., van Laar, M. W., Drummer, O. H. (2009). Dose related risk of motor vehicle crashes after cannabis use: an update. *Drugs, Driving, and Traffic Safety*, 477-499 (Verster, J. C., Pandi-Perumal, S. R., Ramaekers, J.G., de Gier, J. J., eds.).
- “The OR for all the THC concentrations (1 – >5 ng/mL) was statistically significant ($p < .001$). **Including cannabis group into the model revealed a THC concentration breaking point at 2 ng/mL, at which the risk of having an accident was significantly increased.**” Kuypers, K. P. C., Legrand, S., Ramaekers, J. G., Verstraete, A. G. (2012). A case-control study estimating accident risk for alcohol, medicines and illegal drugs. *PLoS ONE*, 7(8): e43496.
- “Case-control studies are inconsistent, but suggest that **while low concentrations of THC do not increase the rate of accidents, and may even decrease them, serum concentrations of THC higher than 5 ng/mL [2.5 ng/mL THC in whole blood] are associated with an increased risk of accidents.**” Sewell, R. A., Poling, J., & Sofuoglu, M. (2009). The effect of cannabis compared with alcohol on driving. *Am J Addict.*, 18(3): 185-193.
- “Using current scientific evidence on cannabis-induced impairment of psychomotor skills and the related accident risk, **this paper suggests a range of 7-10 ng/ml THC in the serum [3.5-5 ng/ml THC in whole blood] for an initial non-zero per se limit.**” Grotenhermen, F., Leson, G., Berghaus, G., Drummer, O. H., Krüger, H. P., Longo, M., Moskowitz, H., Perrine, B., Ramaekers, J. G., Smiley, A., and Tunbridge, R. (2007). Developing limits for driving under cannabis. *Addiction*, 102(12): 1910-1917.
- “The present data thus supports epidemiological data and shows that **THC serum concentrations between 2 and 5 ng/ml establish the lower and upper range of a per se limit for defining general performance impairment above which drivers are at risk.**” Ramaekers, J. G., Moeller, M. R., van Ruitenbeek, P., Theunissen, E. L., Schneider, E., Kauert, G. (2006). Cognition and motor control as a function of Delta-9-THC concentration in serum and oral fluid: Limits of impairment. *Drug and Alcohol Dependence*, 85: 114-122.
- “**For drivers with blood THC concentrations of 5 ng/ml or higher the odds ratio was greater and more statistically significant (OR 6.6, 95% CI 1.5–28.0).** The estimated odds ratio is greater than that for drivers with a blood alcohol concentration (BAC) of 0.10–0.15% (OR 3.7, 95% CI 1.5–9.1).” Drummer, O. H., Gerostamoulos, J., Batziris, H., Chu, M., Coplehorn, J., Robertson, M. D., & Swann, P. (2004). The involvement of drugs in drivers killed in Australian road traffic crashes. *Accident, Analysis and Prevention*, 36(2):239-248.

* Whole-blood concentrations of THC are approximately half of those in plasma or serum. So, a plasma or serum concentration of 10 ng/mL equates to 5 ng/mL in whole blood. Schwilke, et al. (2009). Intra- and Intersubject Whole Blood/Plasma Cannabinoid Ratios Determined by 2-Dimensional, Electron Impact GC-MS with Cryofocusing. *Clinical Chemistry* 55(6): 1188-1195.