

CANNABIS & DRIVING

International Council on Alcohol, Drugs & Traffic Safety

4: Cannabis-Impaired Driving Detection & Toxicology



Are THC concentrations in blood predictive of driver impairment?

At the population level, the higher the Δ^9 -tetrahydrocannabinol (THC) concentrations in blood, the greater the fraction of cannabis consumers who show impairment.¹ This association is clearest in occasional cannabis consumers and may differ in chronic frequent cannabis consumers who develop partial tolerance to the effects of THC. However, at the individual level, it is difficult to predict impairment in individual drivers.

At the population level, the fraction of cannabis consumers who show any degree of impairment increases with higher tetrahydrocannabinol (THC) concentrations in blood.¹

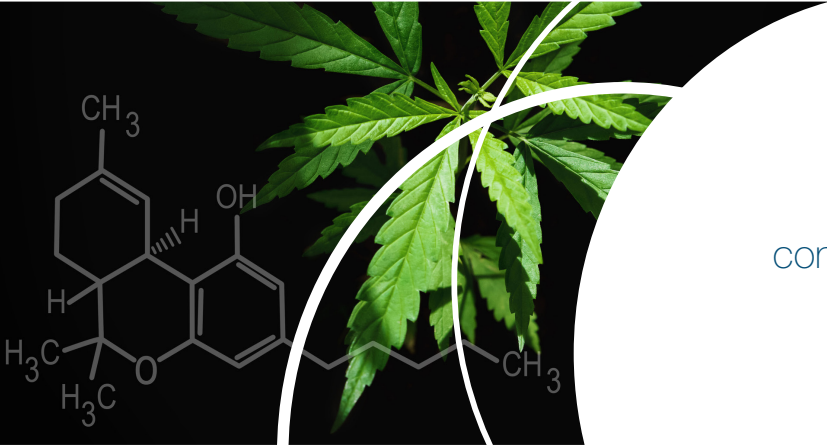


At the individual level, the association between THC concentration and driving performance is difficult to measure.^{1,2} A dissociation between blood THC concentrations and impact on psychomotor function and cognition exists for several reasons. These include:

1. Peripheral blood THC concentrations do not represent THC in the brain.³
2. Individuals may develop partial tolerance after repeated exposure to the impairing effects of THC.^{4,5}
3. After chronic daily cannabis intake, THC (above 1 ng/mL) can be detected in the blood of some consumers for many days, sometimes in the absence of impairment.⁶
4. In road traffic practice, THC concentrations are usually detected in blood up to 1-8 h after a traffic crash or stop. These do not represent THC concentrations at the time of the crash (i.e., blood THC concentrations decrease approximately 74% in the first 30 min and by 90% in the first 1.4 h).⁷
5. THC concentrations widely vary after the intake of different THC formulations while producing similar levels of impairment (e.g., THC peak concentrations are low after oral formulation intake and initially high after vaping or smoking).⁸

Are THC concentrations in oral fluid predictive of driver impairment?

Positive oral fluid test results may indicate recent cannabis use because test sensitivity is usually limited to a few hours after smoking (the time depending upon the detection threshold of the device).⁹ THC in oral fluid primarily represents coating of the mouth after inhalation of drug-laden smoke or vapour. It is not associated with THC concentrations in blood or driver performance.² Two to four hours after cannabis intake, coating of the oral fluid dissipates and oral fluid THC concentrations approximately parallel blood THC concentrations, but not at the same levels.¹⁰ We cannot accurately predict blood concentrations of THC from oral fluid concentrations because of high intra-subject and inter-subject variability.¹¹



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Is there a specific (per se) THC limit that allows differentiation of impaired and non-impaired drivers?

No; while impairment from THC increases at the *population* level, THC concentrations do not predict impairment at the *individual* level.

Can behavioural standardized field sobriety tests (SFSTs) alone reliably detect THC-induced driver impairment?

Current standardized field sobriety tests include horizontal gaze nystagmus (HGN), one leg stand (OLS) and walk and turn (WAT). They were developed to identify alcohol-impaired driving and do not adequately detect THC-induced driver impairment.

THC does not produce HGN.^{12,13} However, of these three behavioural tests, the OLS is the most sensitive at detecting THC effects.^{12,13} The Drug Evaluation and Classification Program (DECP) was later developed to improve the detection of impaired driving following the use of seven classes of drugs in addition to alcohol.¹⁴ The DECP captures physiological measures, pupil size/light reaction, and performance on psychophysical tests including the OLS, WAT, Finger to Nose (FTN), and Modified Romberg Balance (MRB). These are assessed in a highly standardized exam conducted by specially trained police officers. Cannabis significantly increased pulse, systolic blood pressure, and pupil size, with documented errors on the FTN and WAT, eyelid tremors on the MRB, sway on the OLS, and pupil rebound dilation.¹⁵ THC impairment was identified in $\geq 96.7\%$ of THC-impaired driving cases if two of these four test criteria were met, ≥ 3 FTN misses, MRB eyelid tremors, ≥ 2 OLS clues, and/or ≥ 2 WAT clues. False negative rates of the DECP are unknown because these procedures are only applied by police to drivers who are suspected of drug-impaired driving.¹⁵

Many jurisdictions are developing other behavioural tests to detect THC-induced impairment. The major challenge is in distinguishing THC-related impairment from an individual's driving performance when not drug-affected. Such reference data can be collected in laboratory settings but cannot be collected at the roadside. Without such normative data, standards of cannabis impairment are difficult to define for behavioural tests performed on drivers suspected of drug-impaired driving at the roadside.

Are urine drug concentrations alone appropriate to assess impairment in drivers suspected of driving under the influence of cannabis?

No, urine concentrations of cannabis metabolites simply identify past cannabis exposure and in no way identify THC impairment. Urine drug/metabolite concentrations should not be used to interpret the effect of a drug or a chemical on human behaviour.¹⁶

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The International Council on Alcohol, Drugs & Traffic Safety (ICADTS) is an independent not-for-profit body whose only goal is to reduce mortality and morbidity brought about by misuse of alcohol and drugs by operators of vehicles in all modes of transport.

To accomplish this goal, the Council sponsors international and regional conferences to collect, disseminate and share essential information among professionals in the fields of law, medicine, public health, economics, law enforcement, public information and education, human factors and public policy.

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