

Study: THC in blood and saliva are poor measures of cannabis impairment

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Lead author Dr Danielle McCartney from the Lambert Initiative. Credit: University of Sydney

Researchers at the University of Sydney's Lambert Initiative have analyzed all available studies on the relationship between driving performance and concentrations in blood and saliva of tetrahydrocannabinol (THC), the intoxicating component of cannabis.

The surprising results indicate that blood and oral fluid THC concentrations are relatively poor or inconsistent indicators of cannabis-induced impairment.

This contrasts with the much stronger [relationship](#) between blood alcohol concentrations and driving impairment. The findings have implications for the application of drug-driving laws globally, the researchers say.

The study was published recently in *Neuroscience & Biobehavioral Reviews*.

Lead author Dr. Danielle McCartney, from the Lambert Initiative for Cannabinoid Therapeutics, said: "Higher blood THC concentrations were only weakly associated with increased impairment in occasional cannabis users while no significant relationship was detected in regular cannabis users.

"This suggest that blood and oral fluid THC concentrations are relatively poor indicators of cannabis-THC-induced impairment."

For the study, researchers pooled data from 28 publications involving consumption of either ingested or inhaled forms of cannabis. They then characterized the relationships between blood and oral fluid THC concentrations and driving performance (or driving-related skills such as reaction time or divided attention).

For infrequent, or occasional cannabis users, some significant correlations between blood and oral fluid THC concentrations and impairment were observed. However, the researchers note that most of these relationships were "weak" in strength.

No [significant relationship](#) between blood THC concentration and driving performance was observed for 'regular' (weekly or more often)

cannabis users.

"Of course, this does not suggest there is no relationship between THC intoxication and driving impairment," Dr. McCartney said. "It is showing us that using THC concentration in blood and saliva are inconsistent markers for such intoxication."

The research raises questions about the validity of the methods used to assess cannabis-related impairment. This includes the widespread random mobile drug testing for THC in saliva in Australia and the testing for specific concentrations of blood THC that is used to detect impaired drivers in some US states and in Europe.

Dr. McCartney said: "Our results indicate that unimpaired individuals could mistakenly be identified as cannabis-intoxicated when THC limits are imposed by the law. Likewise, drivers who are impaired immediately following cannabis use may not register as such."

The researchers also found that subjective intoxication—how "stoned" individuals reported that they felt—was also only weakly associated with actual impairment.

This means that drivers should not necessarily rely on perception of their own impairment in deciding whether they are fit to drive.

Co-author Dr. Thomas Arkell from the Lambert Initiative said: "Individuals are better to wait a minimum length of time, between three and 10 hours, depending on the dose and route of administration, following [cannabis use](#) before performing safety-sensitive tasks. Smartphone apps that may help people assess their impairment before driving are currently under development and may also prove useful."

Academic Director of the Lambert Initiative, Professor Iain McGregor,

said: "THC concentrations in the body clearly have a very complex relationship with intoxication. The strong and direct relationship between [blood-alcohol concentrations](#) and impaired driving encourages people to think that such relationships apply to all drugs, but this is certainly not the case with cannabis.

"A cannabis-inexperienced person can ingest a large oral dose of THC and be completely unfit to drive yet register extremely low [blood](#) and oral fluid THC concentrations. On the other hand, an experienced cannabis user, might smoke a joint, show very high THC concentrations, but show little if any impairment.

"We clearly need more reliable ways of identifying cannabis-impairment on the roads and the workplace. This is a particularly pressing problem for the rapidly increasing number of patients in Australia who are using legal medicinal cannabis yet are prohibited from driving.

"The increase in legal recreational use of cannabis across multiple jurisdictions worldwide is also making the need for reform of cannabis-driving laws more urgent."

More information: Danielle McCartney et al, Are blood and oral fluid $\Delta 9$ -tetrahydrocannabinol (THC) and metabolite concentrations related to impairment? A meta-regression analysis, *Neuroscience & Biobehavioral Reviews* (2021). [DOI: 10.1016/j.neubiorev.2021.11.004](https://doi.org/10.1016/j.neubiorev.2021.11.004)

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