

**Article:**

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Per Se Driving Under the Influence of Cannabis Statutes and Blood Delta-9-Tetrahydrocannabinol Concentrations following Short-Term Cannabis Abstinence.
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Guests: Drs. Robert Fitzgerald and Thomas Marcotte from the Center for Medical Cannabis Research at the University of California San Diego, in San Diego, California.

Bob Barrett:

This is a podcast from *Clinical Chemistry*, a production of the Association for Diagnostics & Laboratory Medicine. I'm Bob Barrett.

Driving under the influence of alcohol significantly increases the risk of fatal motor vehicle crashes and blood alcohol concentration associated with impairment, 0.08%, is well-established. With increased legalization of cannabis, researchers have turned their attention to establishing a similar threshold for blood THC [delta-9-tetrahydrocannabinol]. Does cannabis use translate to driving impairment in the same way that alcohol does? And if so, what threshold THC concentration should be used to document impairment?

Recent studies have demonstrated mixed results, but the bulk of the evidence suggests that the presence of THC in blood does not translate to significant increase in crash risk. However, other studies have conclusively demonstrated worse driving performance immediately after smoking cannabis. How do we explain this discrepancy? If recent cannabis use impairs driving performance, why isn't there a stronger relationship between blood THC and impairment? And if blood THC doesn't reflect impairment, is there an alternative tool we could use instead?

A new research article appearing in the December 2025 issue of *Clinical Chemistry* addresses these questions. Using a driving simulator, the study team evaluated the performance of regular cannabis users who abstained for 48 hours, asked how many had blood THC concentrations above the per se impairment threshold, and compared performance in those with concentrations above and below this threshold.

In this podcast, we welcome two of the article's authors. Dr. Robert Fitzgerald is a professor in the Pathology Department at the University of California, San Diego and is the director of the Center for Medical Cannabis Research bioanalytical laboratory at UCSD. Dr. Thomas Marcotte is a professor of Psychiatry and co-director of the Center for Medicinal Cannabis Research at UCSD. And, Dr. Fitzgerald, we'll start

with you and we'll just get basic. What does "per se" mean in the context of driving under the influence of cannabis?

- Robert Fitzgerald: So, the "per se" relates to prima facie evidence. Those are, I guess, legal terms and "per se" is a cutpoint for determining intoxication. For alcohol, we use a 0.08% weight by volume as per se, meaning the prosecutor doesn't need to show any other evidence of impairment. Regardless of the driving performance, you are, per se, intoxicated and can be prosecuted. And so, some states have adopted similar things for cannabis and THC, using either a zero tolerance, that's any measurable THC, a 2, or a 5 ng/mL as a per se.
- Bob Barrett: Dr. Marcotte, for the present study, you used a driving simulator to evaluate driving ability. What tasks were included in the simulations and how did you determine impairment?
- Thomas Marcotte: So, for this project, we used 25-minute driving simulations. These simulations emulated driving under various conditions that included driving on a freeway or in business or residential areas. The simulators themselves were wide field-of-view three-monitor displays with a realistic steering wheel and accelerator and brake pedals. To determine impairment in this project, we examined the driving metrics that are the most sensitive to impaired driving. This includes the amount of swerving a person may do during a divided attention task. So, for example, we had the participant take their eyes off the road to do a task on an iPad or something such as responding to lane changes in a car in front of the participant.
- Bob Barrett: Doctor, many studies, including some of your previous reports, show no relationship between concentrations of THC in body fluids and impairment. What does this study add to our understanding of cannabis-impaired driving?
- Thomas Marcotte: So, in this study, we looked at per se cutpoints in particular. We found that following abstinence of two or more days, many regular users are at risk of being found guilty of driving under the influence in states where per se cannabis laws exist. Of the 190 cannabis users in our study, between 5% and 43% of participants would be guilty under such laws, depending on the per se cutpoint. In addition, and importantly, we showed that participants who exceeded per se cutpoints performed the same on the driving simulator prior to THC administration as participants who are below these per se cutpoints.
- Bob Barrett: Dr. Fitzgerald, one of your subjects had a baseline or pre-treatment concentration at 16 ng/mL. This seems like active use. How did you determine that this was likely the participant's baseline concentration?

Robert Fitzgerald: Yes. This participant was really interesting to us. Initially, we were concerned that perhaps they used cannabis the morning of the study before coming in. And so, we looked at the kinetics of THC in all of our subjects. Since we had 190 subjects, we had a lot of data to look at and we wanted to put it in that context. For subjects that smoked placebo, the concentration of THC at baseline were not different from the last timepoint of the study, about five hours after smoking. For subjects who smoked active drug, the concentrations at the end of the study were within a half a nanogram of baseline, so they pretty much returned to baseline at the end of our study.

The subject with 16 ng was in the active drug arm of the study. They reached a maximum THC concentration of 135 ng/mL after smoking and then slowly came back down, and by the end of the study, they were back at a baseline of 16. So, this convinced us that the subjects' baseline walking around THC concentration was 16 ng/mL, much higher than all of the per se cutpoints.

Bob Barrett: Dr. Marcotte, since there are problems using blood concentrations, is oral fluid a solution? Doesn't that more closely match recent use than blood THC concentrations?

Thomas Marcotte: So, oral fluid certainly seems to be an improvement on whole blood in that, at least in the case of smoked cannabis, the period of detection and infrequency, and importantly in frequent users, is shorter and more closely aligned with the timing of risks for impairment than what we see in blood. However, it's also important to keep in mind what oral fluid does not tell us.

So, oral fluid is often referred to as showing "recent use." While recent use is relative, a number of studies have shown that THC in oral fluid may be detectable for 12 to 24 hours, or long after impairment has waned. Now, it's possible that different cutpoints could potentially better identify recent use and that work is currently underway. In addition, it's important to keep in mind that the presence of THC in oral fluid does not indicate that drivers are impaired. It only indicates that they've been exposed to THC.

Bob Barrett: Well, that's interesting. Dr. Fitzgerald, are there limitations to this study?

Robert Fitzgerald: It's just like any lab study, like any study, there are limitations, and one of the primary limitations was that we could not independently confirm the period of abstinence on the study day. For example, these participants were not in a lockdown or a monitored unit for the 48 hours prior to testing. Such studies are really expensive to conduct. However, we did assess their recent use via oral fluid screening at the

beginning of the study day and excluded individuals who screened positive at 5 ng/mL. In addition, our kinetic data actually shows that our participants had similar baseline and end-of-study THC concentrations, confirming that they did not use cannabis the morning before coming to the study.

Bob Barrett: Well, finally, Dr. Marcotte, let's look ahead. It appears that identifying drivers who are under the influence of cannabis is more difficult than with alcohol. So, what are the next steps that you would like to see to help make our roadways safe?

Thomas Marcotte: Moving forward, we think it's essential that researchers work with law enforcement to continue to develop scientifically-based methods for identifying impaired drivers, as well as also methods for determining recency of use. Importantly, this includes looking at polydrug use since very few roadside evaluations end up involving cannabis only. On the public health messaging side, we think it's important that the messaging also be consistent with what we know about the science of cannabis impairment. For example, when people use edibles, the impairment will typically last significantly longer than when one smokes or inhales cannabis. And lastly, it's important to keep in mind that while not everyone will become significantly impaired following use, people are not necessarily accurate in determining their own level of impairment.

Bob Barrett: That was Dr. Thomas Marcotte and Dr. Robert Fitzgerald from the University of California, San Diego. They wrote a new research article in the December 2025 issue of *Clinical Chemistry*, assessing the appropriateness of whole blood THC cutpoints for assessing driving impairment in regular cannabis users. They've been our guests in this podcast on that topic. I'm Bob Barrett. Thanks for listening.