Q&A: New research gains ground in detecting recent cannabis use

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Whether people use cannabis to induce sleep, relieve symptoms or relax during downtime, a vehicle crash or accident at work could leave them in jail or the unemployment line. Frequent users can lose their jobs or face

criminal charges, even if their last puff or gummy was days or weeks prior to an incident.

Drug tests commonly used today cannot reliably detect how recently someone used cannabis or even whether they were impaired when an accident occurred. Blood tests used by law enforcement typically measure THC (Delta 9-tetrahydrocannabinol), the chief psychoactive component of the drug.

"Since THC accumulates and lingers in fat tissue, daily cannabis users may maintain constant elevations of THC in the blood even long after the psychoactive effects abate," said Michael Kosnett, MD, MPH, an associate adjunct professor and cannabis researcher at the Colorado School of Public Health in the Department of Environmental & Occupational Health.

Now that cannabis has joined alcohol on the legal substance list, the importance of fixing the shortfalls of the widely used tests has escalated, Kosnett said.

"There has been a lot of concern about whether the use of cannabis has been associated with an increased risk of motor vehicle crashes or accidents in the workplace."

When careers and criminal records are at stake, accuracy is crucial, Kosnett said. In a recent study published in June in *Clinical Toxicology*, he and colleagues looked at metabolite ratios as indicators rather than THC alone and found a 98% specificity rate in determining whether a person had used cannabis in the past 30 minutes.

Kosnett, the lead author of the study, shared more about his team's work and what it means in the condensed Q&A below.

What is the issue you are trying to address in the workplace?

Currently, when people (from forklift operators to ride-share drivers) get into a crash or mishap at work, the most typical thing that happens is their employer requires a urine drug test. But the urine drug test measures an inactive metabolite of THC called carboxy THC (THC-COOH). So they are measuring something in the urine that doesn't even have psychoactive effects. More than that, it stays positive long after the acute psychomotor and neurocognitive effects of using cannabis last.

And what about after a motor vehicle accident?

The police tried to improve upon this situation for drivers by measuring THC in blood. But even when you are measuring THC itself in the blood, which is psychoactive, it doesn't necessarily tell you how long ago the person used it. And the reason for that is THC is a very fat-soluble substance, and the THC comes out of the blood and gets stored and builds up in a person's body fat.

For people who use cannabis nearly every day (such as medical users), the level in their blood can be rather high. It can even sometimes be as high or higher after not smoking for more than a day than the level of an occasional user right after they smoked.

Then the tolerance factor comes into play. Even though they have an elevated THC level, daily users may not be intoxicated. Why is that? Their brains actually down-regulate the receptors for THC, so they develop a tolerance. So they can have levels that are four to five times higher than the occasional users and not appear affected.

If after a workplace mishap or vehicle accident, employers or police

obtained a blood level on the driver and found a level of THC of like 7 ng/mL, let's say, that could be consistent with an occasional user having just smoked it, or it could be a level of a daily user who hasn't smoked in half a day or longer. [These result](#)s were published in *Accident Analysis and Prevention* in 2021, with my colleague Ashley Brooks-Russell, Ph.D., MPH, as the lead author.

Can you talk about the driving simulation study you and your colleagues conducted to compare daily and non-daily cannabis users?

We would have volunteer research subjects arrive in the morning after they hadn't smoked cannabis for at least eight hours or hadn't ingested cannabis for at least 12 hours. Daily users consumed it every day, and people who were occasional users used it at least once but not more than twice a week. And we had a control group that didn't use it all.

We drew blood at baseline and put participants in the driving simulator, and they drove for 30 minutes. We measured various aspects of their driving. And then they smoked. Our instructions were smoke "the amount you most commonly use for the effect you most commonly desire." And they had up to 15 minutes to smoke. Then, another 15 minutes after that, we drew their blood. And 15 minutes after that, they returned to the driving simulator.

One of the things that we showed was at that 30-minute period, the level of THC in the blood of the daily users was about five times higher on average than the occasional users, but the occasional users showed evidence of decrement in their driving skills, whereas that wasn't statistically significant in the daily users.

Can you share the highlights of the published study

that followed?

Yes, we think it is pretty important news. We used the blood of our observational driving study participants and measured whole blood THC and its metabolites at baseline and 30 minutes after starting a 15-minute interval of smoking cannabis. There were 24 occasional and 32 daily users, and we calculated two blood cannabinoid molar metabolite ratios. We compared these to blood THC levels alone.

For identifying recent cannabis smoking, a cut-point of 0.18 or higher for the molar metabolite ratio of THC to THC-COOH in blood yielded:

- 98% specificity (which means an only 2% false positive rate)
- 93% sensitivity (which means the test will fail to detect recent use only 7% of the time)
- 96% accuracy (which combines the two rates) for identifying recent cannabis smoking.

By comparison, a top cut-point for THC alone yielded 88% specificity, 73% sensitivity and 80% accuracy.

So if you have a rule that says you can't use cannabis at work and a person has a molar metabolite ratio above the cut-point, you can feel pretty confident (with 98% specificity) that the person just used within the past 30 minutes.

What's next for you and your colleagues?

One of the limitations of this study is that we only measured levels at 30 minutes after people started smoking. Not everyone gets their blood drawn that quickly after an incident. We have work underway where we are measuring metabolite ratios at different time intervals and with more

participants.

You also can't conclude that just because the ratio was elevated in and of itself with this test that the person was impaired. We're working on that too. But I think, even right now, this work is helpful. When you are using a test that has implications for people's jobs or for convictions, you generally want to have something that's very specific. With this test's specificity of 98%, we can have high confidence that this isn't a false positive.

More information: Michael J. Kosnett et al, Blood cannabinoid molar metabolite ratios are superior to blood THC as an indicator of recent cannabis smoking, *Clinical Toxicology* (2023). [DOI: 10.1080/15563650.2023.2214697](#)

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