Beyond Limits: SOBEREYE's Vision for Modernizing Workplace Impairment Testing

INTRODUCTION

As of early 2024, adult-use cannabis is legal in 24 states and territories, and medical cannabis programs exist in 38. The U.S. Department of Health and Human Services (HHS) recently recommended to the U.S. Drug Enforcement Agency (DEA) that they reschedule cannabis from a Schedule I drug (the most restrictive schedule) to Schedule III because cannabis does have legitimate medical uses and is not highly addictive; National Institute on Drug Abuse (NIDA) supports this recommendation. A November 2023 Gallup poll found that fully 70% of Americans favor national cannabis legalization, with solid majority support regardless of demographics or party affiliation. **(1)** The 1970s-era War on Drugs instigated an antagonistic approach not only to those with substance use disorders but to drug use in general, but the tide is turning.

Meanwhile, employers must balance several competing requirements. They are understandably concerned about cannabis use and on-the-job safety. Workplace accidents are expensive. In the United States, 14 workers are injured every second; in 2022, a worker died from a workplace accident every 96 minutes. **(2, 3)** The average employer spends about $120,000 on every workplace injury incident. Besides the financial toll, businesses face reputational damage, lower productivity, and, most importantly, the human cost of lives damaged or lost.

WORKPLACE SAFETY AND FITNESS FOR DUTY

Occupational and safety attorney and trainer Adele Abrams emphasizes that under OSHA rules, employers have a "legal obligation to protect workers from direct threats to safety, [with] new penalties [up to] $161.3K per incident." **(4)** OSHA does not have specific rules on drug testing, but employers must ensure their policies comply with anti-discrimination laws, respect employees' privacy, and avoid unfair practices. In short, they are to regard medical cannabis patients as workers with medical issues rather than as drug abusers. The U.S. Department of Transportation (DOT)-related positions, which fall under federal jurisdiction, still require pilots, train conductors, and commercial drivers to abide by zero-tolerance rules, but the safety policies of many other industries are shifting from traditional drug testing to impairment detection, focusing instead on workers' "fitness for duty."

There are practical reasons for this switch. For one, businesses that disqualify applicants who test positive for cannabis severely limit their pool of eligible candidates, potentially passing over fully qualified and functional applicants. Second, some states—most recently California—have enacted worker protections prohibiting employers from firing an employee based on one positive drug test. Even in states where drug testing in the absence of reasonable suspicion is still allowed by law, more businesses are eschewing it, lest the requisite dismissals leave them short-staffed. One employer notes, "If I drug-tested everyone, I'd go out of business." **(5)**

UNIQUENESS OF CANNABIS PHARMACOKINETICS

The third and perhaps least obvious reason for the shift is that traditional drug-detecting urinalysis' per se limits are not valid measures of cannabis impairment. According to McCartney et al., "Blood and oral fluid THC concentrations are relatively poor indicators of cannabis/THC-induced impairment." **(6)** Further complicating the calculus of whether to test workers for drug use is the fact that legal hemp-based CBD products, which are nonintoxicating even with recent use, can trigger a positive screen. **(7)** Hemp (the source of many CBD products) can contain up to 0.3% THC; it is not necessarily THC-free.

Many employers use a per se THC blood limit of 50 ng/mL (some use 20 ng), even though cannabis affects the human body in unique ways, different from alcohol. Blood alcohol concentrations (BACs) of 0.05 (characterized as "buzzed") and 0.08 ("drunk") are widely recognized as valid indicators of recent use and attendant impairment. **(8)**

UNIQUENESS OF CANNABIS PHARMACOKINETICS CONT...

Employers do not discriminate against employees who drink alcohol off the clock, but an employee who used cannabis on the weekend (or at home) may be unfairly deemed a risk when he is not impaired. A recent Canadian study by Carnide et al. found that while there is a two-fold increase in the risk of accidents for those who used cannabis while on the job, there was no increase in the risk of workplace injury from those who used cannabis off-duty. **(9)**

Regardless of when it is used, cannabis metabolites do not clear the user's system in a standard fashion. Each person is different. Clearance rates depend on the individual's body composition (THC is stored in fat cells, so portly partakers may hold onto 11-hydroxy THC for months), frequency of use, the potency of cannabis used, and method of administration—that is, whether the cannabis came in a joint, brownie, gummy, capsule, transdermal patch, sublingual tincture, inhaler, or suppository and whether it was consumed with food or an oily food that promotes bioavailability. These factors combine to influence every aspect of cannabis pharmacokinetics—rates of absorption, distribution, metabolism, and excretion. Thus, a positive cannabis drug test is not a valid indication of impairment as it is for the other substances (amphetamines, cannabis, cocaine, phencyclidine (PCP), and opiates) in the standard five-panel drug test.

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TOLERANCE AND TESTING

Medical cannabis patients in particular develop tolerance, so their blood or urine level of THC or its metabolites may easily exceed a given limit without any concomitant impairment. Patients often fare better on impairment tests *after* they have dosed with cannabis compared to their baseline, presumably because cannabis alleviates pain, anxiety, or insomnia, effectively tamping down those known impediments to cognitive agility.

DEFINING IMPAIRMENT

Workplace safety conversations have shifted from a per se drug limit to fitness for duty, but what constitutes impairment? Consider this sensible, nuanced definition: **(10)**

The inability to function normally or safely because of any number of critical factors—from chemical factors such as legal and illicit drugs, physical factors such as fatigue or certain mental conditions, as well as social factors like stress, or other mental distress. Each of these factors and more can present a fitness for duty, concern and impact, employee health, safety, and well-being.

- National Safety Council

EMERGENCE OF IDTS

A burgeoning industry of impairment detection technologies (IDTs) has arisen in this rapidly shifting regulatory landscape. Trucking companies have long used fatigue cameras to detect shifts in drivers' attention and posture, but the cameras are better at documenting accidents than preventing them.

Employees and employers need an earlier warning system. To meet the growing demand for workplace solutions, IDTs like cognitive testing apps, brain-imaging caps (in development), and full-body scans aim to flag compromised faculties before any damage is done, but not all high tech solutions are portable, cost-effective or intuitive for employees to use. **(11)**

SOBEREYE: AN AI DRIVEN IMPAIRMENT DETECTION SOLUTION

One ingenious and user-friendly IDT is SOBEREYE, an AI-driven startup from California, which measures the Pupillary Light Reflex (PLR), an autonomic response of the eye to bright light that indicates nominal function of both the somatic processing (incoming signals from the periphery) and the central nervous system response (in this case, pupillary constriction). The rate of pupillary constriction and the delay to respond to a light stimulus, as well as incongruities between the two eyes' pupil measurements, all serve as markers of neurological soundness. Conversely, irregularities in those indices indicate problems in brain function. Over two weeks, the device is calibrated for a particular user, making false positives on subsequent tests highly unlikely (less than 0.1%). **(12)** Because of this required baseline assessment, SOBEREYE is not suited to one-off roadside testing but is ideal as a workforce solution, especially for crews in safety-sensitive roles. Of note, the device scans for PLR alterations in real-time; it is cause-agnostic, only measuring the effect, not the source of impairment.

SOBEREYE patented its approach utilizing a smartphone and an opaque enclosure to make accurate PLR measurements to detect impairment, but the practice of pupillometry is not new. Pupillometry has been used to study cognitive and visual processing since the mid-1700s, initially in sleep research; the wireless, efficient, and accurate recording of PLR changes is the new piece.

SOBEREYE: AN AI DRIVEN IMPAIRMENT DETECTION SOLUTION CONT...

In the last century, researchers and clinicians have used PLR to assess neurological changes from a wide variety of conditions like Parkinson's, Autistic Spectrum Disorder, attachment-related trauma, postoperative pain, schizophrenia, and recently, long COVID. **(13, 14, 15, 16, 17, 18)** Though influenced by transitory conditions like psychophysiological stress, Niehorster et al. found that PLR is nonetheless not conditionable—the reflex is completely automatic, with no "practice effects" to bias test results. **(19)**

ADVANTAGES OF SOBEREYE'S SOLUTION

The pass/fail (nominal or not) results of the SOBEREYE assessment are stored securely in the cloud and anonymized to protect worker identities. This data is further protected according to ISO/IEC 27001 standards. Because of the built-in identification capacity of the workplace safety solution, the user never needs to log in after the initial use, the users' iris is recognized and paired with historical data automatically. This saves workplaces valuable time, as one safety expert noted that in construction, mining, or trucking, companies are not likely to adopt an impairment detection tool that takes longer than one minute. The quick test can be performed before deployment to a job site, midday, or even after work to assure that employees can drive home safely.

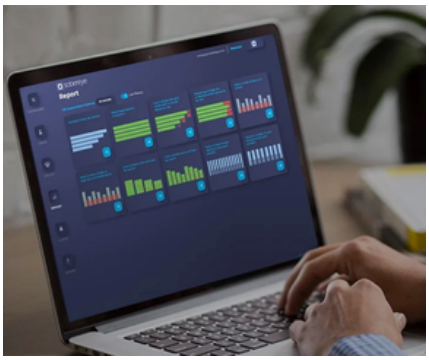
Another side benefit of the SOBEREYE platform is the fact that users self-test, conferring an unspoken respect for the worker's dignity. This is not an invasive or potentially embarrassing process like urinalyses can be. Users tend to self-regulate their off-duty behavior when they know they will be tested at work the next morning. Whether that means having one drink fewer or taking the cannabis edible at 9:00 PM instead of midnight, the change benefits the employee and all who rely on his sober judgment on the job.

ADVANTAGES OF SOBEREYE'S SOLUTION CONT...

This is not about the employer checking people, but the employer giving people a tool and saying, "Look, you may show up at work without even realizing that you are either too tired or you have a side effect of this medication, or maybe you took your marijuana because you have back pain and you show up at work not realizing you are affected. We want you to go back to your family at the end of the working day."

- Antonio Visconti, CEO, SOBEREYE

One safety expert relates how a construction crew incorporates impairment assessment into their workday routine. They form their "daily huddle" (an example of a "high touch, low tech approach") where the foreperson discusses the tasks for the day, which procedures will be the most hazardous conditions to watch for. They do a series of warm-up stretches, which build cohesion while simultaneously giving the impairment detection-trained foreman a sense of workers' coordination and reflexes which will be needed on the job site. They then all take turns doing their impairment assessment to validate that they are fit for duty. As one crewmember says, "Then I know that the guys beside me are on their game, and they know the same about me. We can rely on each other, go out and do our jobs." **(20)**



DETERMINING THE RIGHT DOSE

For medical cannabis patients, SOBEREYE's objective assessment of alteration could prove particularly helpful. Cannabis is notoriously personalized medicine, and patients often require trial and error to find their minimum effective dose—that which treats their medical condition with the fewest side effects. Therapeutic cannabis experts advise new patients to "start low and go slow" but can provide no standardized dosage to treat a given symptom. Having access to an accurate measurement of impairment could truncate the trial-and-error period, helping patients titrate to their ideal dosage and timing to avoid having their medicine impact work performance, driving, or other complex tasks. Using the SOBEREYE assessment at work could also help flag impairment from adverse effects of medical cannabis like decreased reaction time or alertness, important workplace safety considerations noted by O'Neill and colleagues' (2023) systematic review. **(21)** As stakeholders in newly legal cannabis industries across the U.S. hold themselves accountable to demonstrate responsible use, they could help validate the technology and show legislators that the industry takes workplace and highway safety seriously.

If you show up at work and the tool [flags your test], you say, "Gee, I'm not okay? I took the stuff six hours ago!" Well, that's a teaching moment, right? You thought that taking it six hours ago was safe, but [now you see] it is not. All right. Maybe you have to take your medication in a different way.

- Antonio Visconti, CEO, SOBEREYE

BROADER APPLICATIONS FOR PLR

While SOBEREYE has focused on construction, transportation and mining, the device has broad potential beyond safety-sensitive industries. These PLR-recording headsets could be used by high school sports teams as part of a post-concussion exam to check for signs of traumatic brain injury; by Olympics teams, as a pre-competition neural assessment, so future athletes like will not be unfairly punished for lawful medical cannabis use off the field as was Sha'carri Richardson in 2021. **(22)** Beyond terra firma, Shirah, et al. (2023) foresee the utility of automated pupillometry as a sensitive tool for monitoring astronauts' health on space missions as they experience headward fluid shifts and increases in intracranial pressure due to altered gravity environments. **(23)**

CANNABIS LEGALIZATION AND WORKPLACE SAFETY

In 2024, it's likely that several U.S. states will decide whether to legalize medical and/or adult-use cannabis. The discourse on workplace safety conditions will likely intensify. A recent survey by the National Safety Council found that 71% of employers believe their subordinates would notify them if they feel too impaired to work, but only 42% of employees say they actually would admit impairment to their superiors. **(24)** This is a significant disconnect between perception and reality. The safety industry, more focused more on whole worker health, urges businesses to:

- establish clear, written workforce safety policies
- review those policies regularly, updating them in accordance with recent federal and state regulations
- devise strategies that foster candid communication
- allow employees to report real-time impairment without fear of reprisal.

I still find people who say, “Oh, this is great, but how does this hold up in court?” I say, “You do not understand. You do not fire people that do not pass our test. There is no holding a court. There's no litigation.” What do you do? You say, “Look, it's dangerous for you right now. I'm going to reassign you, or maybe I can send you home, but you're not fired. Go home. Rest, recover. If it is a medical condition, you know it. Talk to a doctor, make sure that tomorrow this doesn't happen again.”

- Antonio Visconti, CEO, SOBEREYE

THE BOTTOM LINE

Everyone in the workplace shares the same goal: to get work done safely. According to Visconti, there is room for hundreds of impairment detection companies—so widespread and critical is the need for workplace safety in an era of fatigue, use of intoxicants and mental distraction. The years invested in developing SOBEREYE's technology are justified by the profound impact of saving even a single life.

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