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Alcohol and Drug Testing

Informational Guidelines for Occupational Drivers

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EXECUTIVE SUMMARY

Twenty-two percent of people admit to using drugs or alcohol during work hours.[1] Drugs and alcohol can negatively affect task performance, putting individuals under the influence of drugs and/or alcohol at an increased risk of injury. These injuries increase employers' health care costs and lead to employee time off and increased employee turnover. Other costs borne by employers include absenteeism or diminished employee capacity due to poor health. Drug testing is one way that employers can curb employee alcohol and drug use and lower rates of injury, lost work time, absenteeism, presenteeism (where employees are at work in body but not in mind), and turnover.

Commercial motor vehicle (CMV) drivers are highly susceptible to severe injuries to themselves and to others because of the nature of their job (i.e., potential for being involved in a crash). Using alcohol or drugs while driving increases a driver's risk of being involved in a crash.[2,3] In one case-control study, researchers found that drivers who had a measurable breath alcohol concentration were nearly 4 times more likely to be involved in a crash than drivers with no measurable alcohol content.[3] Of all large truck drivers who were involved in a fatal crash in 2017, among those who were tested, 5.5% tested positive for at least one illicit drug.[4]

In an attempt to combat the problems with alcohol and drug use in the CMV industry, the Omnibus Transportation Employee Testing Act of 1991 requires all Department of Transportation (DOT) agencies to conduct drug and alcohol testing of safety-sensitive transportation employees, which includes CMV drivers.[5] Federal guidelines require alcohol and drug testing under a variety of circumstances, such as pre-employment, after involvement in a Federal Motor Carrier Safety Administration-reportable crash, randomly, on return-to-duty and in a series of follow-ups after a positive drug or alcohol test result. Though not required, employers of CMV drivers also are allowed to test an employee for drugs and/or alcohol immediately, based on reasonable suspicion, at any time.

Testing CMV drivers for alcohol and drugs at the times prescribed can help create safer roads for everyone. Some previous research found that workers who tested positive on pre-employment drug tests had a higher risk of injury than those who did not, and that random drug testing was associated with a downward trend of work-related injuries.[6] However, one loophole in the current regulations is that alcohol and drug test results do not follow a driver to future carriers. This means that a driver who tested positive at a previous employer can simply go to a different carrier and pass a drug test without acknowledging the previously failed test. The Drug and Alcohol Clearinghouse is a central repository of all CMV drivers' drug and alcohol violation records. Carriers are required to submit positive drug testing results to the Clearinghouse and query it before hiring any new driver. The Clearinghouse closes the loophole and allows carriers to identify drivers misusing alcohol and drugs and avoiding treatment.

In addition to alcohol, five main drugs are included in the standard DOT drug tests for CMV drivers: marijuana, amphetamines, cocaine, opiates/opioids, and phencyclidine (PCP). Research has demonstrated that all of these substances have negative effects on the driving task, which can lead to an increased crash risk. Alcohol consumption impairs oculomotor function and can lead to delayed reaction time and degraded ability to track and process information, which is required

for decision-making while driving.[7] Marijuana contains a psychoactive compound called delta-9 tetrahydrocannabinol (THC), which research has noted leads to increased reaction time, decreased driving speeds, and memory impairments.[8,9] Amphetamine misuse is high in the CMV driver population, most likely because of its increased alertness effects on the user.[10,11] However, amphetamine use can also affect the user in negative ways, such as lack of coordination and drowsiness once the drug wears off.[11] Cocaine use results in increased driving speed, inattention, and reduced vehicle control.[12] Opiates/opioids can cause drowsiness and the inability to concentrate.[13] PCP can cause paranoia, dreamlike states, and seizures, all of which can lead to reduced driving ability.[14,15] Overall, all of these diminished capacities lead to higher crash risks for users compared to those who do not use any of the substances while driving.

Breath, oral fluid, urine, blood, and hair samples are the most common methods used to test for alcohol and drugs, and each has its benefits and drawbacks.[16] Breath and oral fluid are the least intrusive samples to collect, whereas urine may require some level of observation during collection to ensure the sample is not tampered with. Blood requires venipuncture, and hair samples remove a small chunk of a person's hair, both of which are the most intrusive of sample collection. In general, breath, oral fluid, and blood have shorter drug detection windows, which means they are better suited for the detection of recent use and possible impairment, such as following a crash or for reasonable suspicion.[17,18,19,20,21,22,23,24,25] Urine has a detection window of a few days (or weeks for chronic users with some drugs). It will not indicate a current impairment level but may indicate general substance use, and is well suited for pre-employment testing, follow-up, and return-to-duty testing.[20,22] Hair testing can determine chronic use or use over several previous months, which also lends itself well to return-to-duty and follow-up testing.[22,26]

If done efficiently and consistently, drug and alcohol testing in the CMV industry can lead to safer roads and fleet savings. However, there is more an employer can do to create and maintain a drug-free workplace. The Substance Abuse and Mental Health Services Administration (SAMHSA) recommends that workplaces have a written drug and alcohol testing policy, employee education on drug misuse, supervisor training on the drug and alcohol policy, and employee assistance programs.[27] Furthermore, CMV fleets should evaluate their drug and alcohol program to determine how well a program is working and areas needing improvement. This will inform asset allocation to create the greatest overall impact for employees while saving employers money and effort.

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LIST OF ABBREVIATIONS AND SYMBOLS

BAC	blood alcohol concentration
CMV	commercial motor vehicle
D&A	drug and alcohol
DOT	Department of Transportation
EAP	Employee Assistance Program
FMCSA	Federal Motor Carrier Safety Administration
PCP	phencyclidine
SAMHSA	Substance Abuse and Mental Health Services Administration
SAP	substance abuse professional
RR	relative risk
THC	tetrahydrocannabinol

CHAPTER 1. EFFECTS OF SUBSTANCE USE ON WORK

Over half of the adult population in the United States uses alcohol, and approximately 39% and 17% of adults aged 18 to 25 and 26 or older, respectively, used illicit drugs at least once over the previous year according to a 2018 national survey.[28] Furthermore, over half of adults with a substance use disorder are employed full time, and 22% of people admit to using drugs or alcohol during work hours.[1,29] Alcohol and drug use at work can have significant negative impacts for employers, including increased costs associated with injuries, loss of work, absenteeism, presenteeism (where employees are at work in body but not in mind), health care, and turnover. Many employers conduct alcohol and drug testing in order to combat the behavior and negative effects that substance use has on their business.

EFFECTS OF SUBSTANCE USE ON WORK PERFORMANCE

As many substances negatively affect performance, impaired workers may be at an increased risk of injury. Thus, most research on alcohol and drug use in the workplace is focused on injury reduction. Spicer and Miller[30] found that workers with substance use problems were 1.35 times more likely to have a workplace injury than those without substance use problems. To investigate if drug testing affected injury rates, Feinauer and Havlovic[31] collected questionnaire and archival drug testing data from 48 Wisconsin businesses. Researchers found that businesses using post-incident drug testing had significantly lower Occupational Safety and Health Administration recordable incident rates than businesses not using post-incident drug testing. This study also found that pre-employment or reasonable-cause drug testing was not associated with a change in Occupational Safety and Health Administration incident rates, which suggests that the timing of alcohol and drug tests is important.

According to the Centers for Disease Control and Prevention (CDC), substance use ranks in the top 10 most important public health issues facing the United States today, costing the nation $64 billion annually in health care.[32,33] Part of these health care costs are borne by employers through health care premiums and workers' compensation claims. Research by Schofield et al. found that drug testing was associated with reduced worker's compensation claim rates in the construction industry.[34] Additionally, Gerber and Yacoubian[35] found that drug testing in the construction industry halved workers' compensation claim rates within 2 years of implementation. However, a study investigating drug testing across various work sectors, such as mining, transportation, manufacturing, etc., found that a significant reduction in workers' compensation claims was found only in the construction and service industries.[36]

When injuries are severe enough, employers may lose work time while the employee takes time off to recover. A study of workers' compensation claims data in Washington state found that some firms experienced less lost work time due to injuries if they had a drug-testing program accompanied by an employee assistance program (EAP).[36] However, it was unknown if drug testing alone resulted in a decrease in lost work time.

Work absenteeism and presenteeism are two other issues that alcohol and drug testing aims to reduce. Individuals using drugs or alcohol may be more likely to miss work due to their substance use. One blind longitudinal study found that employees who tested positive on pre-employment drug tests but who were still hired had a rate of absenteeism 59.3% higher than

workers who tested negative,[37] though another study involving restaurants found that absenteeism did not significantly differ between establishments with and without pre-employment drug testing.[38] Presenteeism occurs when employees still go to work even though they have diminished capacity to do their job.[39] Nagata et al. found that, among employees of four pharmaceutical companies in Japan, presenteeism cost employers nearly six times as much as absenteeism.[40] Presenteeism can occur for a number of reasons in addition to substance use, such as muscle fatigue, exhaustion, migraines, etc. Additional research is needed to fully understand substance use's impact on presenteeism in the workplace.[41]

In addition to absenteeism and presenteeism, work injuries and substance use may increase employee turnover. The loss and rehiring of employees (turnover) increases costs associated with recruiting, selecting proper candidates, administrative work, and new hire training. A study by the Center for American Progress found that it costs approximately one-fifth of an employee's annual salary to find and hire a replacement.[42] The Bureau of Labor Statistics determined that the median annual wage for heavy and tractor-trailer truck drivers was $43,680 in 2018.[43] Thus, replacing a CMV driver would cost an average of $9,000, an increase from the estimated $6,000 in 2002.[44] The CMV driver turnover rate was near 90% in 2018 (in the truckload segment), putting a huge financial burden on carriers. Drug testing may help reduce the risk of employee loss. Previous research found that workers testing positive on pre-employment drug tests had a greater risk of being fired.[37,45] However, pre-employment drug testing may also deter individuals using illicit substances from applying to positions which require drug testing and hence assist in keeping illicit drug users out of that workplace. The evidence to support this concept is currently inconclusive.[46,47]

SUBSTANCE USE AND CMV DRIVERS

Using alcohol or drugs while driving increases the risk of being involved in a crash.[2,3] In Lacey et al.'s case-control study of alcohol and drug use, researchers found that, depending on the concentration of alcohol in the breath, drivers were 2 to nearly 4 times more likely to be involved in a crash than drivers with no alcohol present.[3] In 2017, the Federal Motor Carrier Safety Administration (FMCSA) reported that 3.6% of fatal crashes involving large trucks involved drivers with a blood alcohol concentration (BAC) of .01 or higher, while 2.5% of the drivers had a BAC of .08 or higher.[48] However, only half of all large truck drivers involved in fatal crashes were tested, and 5.5% of those who were tested were positive for at least one illicit drug. Further, the Large Truck Crash Causation Study listed drivers' prescription drug use and over-the-counter drug use in the top 10 associated factors for large truck crashes.[4]

Federal Guidelines for CMV Driver Drug Testing

The U.S. Department of Health and Human Services oversees the Substance Abuse and Mental Health Services Administration (SAMHSA), which developed the guidelines for federal workplace drug testing. They suggest five key components for a successful drug-free workplace, one of which is drug testing.[25] The Omnibus Transportation Employee Testing Act of 1991 requires all Department of Transportation (DOT) agencies to conduct drug and alcohol testing of safety-sensitive transportation employees.[5] The federal guidelines require that employers of CMV drivers conduct alcohol and drug tests under a number of circumstances, including pre-

employment, after involvement in an FMCSA-reportable crash, randomly, on return-to-duty, and for follow-ups.

- **Pre-employment:** all employers of CMV drivers must receive a negative drug test from a CMV driver before employment.
- **Post-crash**: all CMV drivers must be drug tested if involved in an FMCSA-reportable crash, which is a crash that results in a fatality, bodily injury, or disabling damage to any motor vehicle requiring a tow away UNLESS the driver was not issued a citation AND there was no human fatality.
- **Random**: all employers of CMV drivers must randomly test a minimum of 50% and 10% of the average number of driver positions they hold annually for drugs and alcohol, respectively. The drug testing can be conducted at any time, but an alcohol test can only be administered just before, during, or after a safety-sensitive function. Every CMV driver should have an equal chance of being selected during each random testing time.
- **Return-to-duty**: drivers who tested positive, refused, or violated any of the seven prohibitions outlined in 49 CFR Part 382 Subpart B and completed the return-to-duty process must submit a negative test conducted under direct observation before resuming driving operations.
- **Follow-up**: drivers who have completed the return-to-duty process successfully must also submit at least six directly observed negative test results in the following 12 months.

In addition, a trained supervisor may also test an employee for drugs and/or alcohol immediately based on reasonable suspicion outside the predetermined times listed above; however, this is not required by the United States Department of Transportation (USDOT).

As of January 2020, the USDOT requires that, in the above tests, CMV drivers must be tested for the following five major classes of drugs using a urine sample: marijuana, amphetamines, cocaine, phencyclidine (PCP), and opioids. Each drug class has a concentration limit which, if exceeded, will result in a positive drug test result. The USDOT alcohol test is conducted using a breath alcohol screening device or an oral fluid sample. If a driver has a BAC of .02% or higher, that driver is removed from service for 24 hours. If a driver has a BAC of .04% or higher, that driver must be evaluated by a substance abuse professional (SAP) and complete a recommended treatment plan before returning to work.

Timing of Alcohol and Drug Testing

Using drug testing at the above times can help to ensure that safer CMV drivers are on the road. Pre-employment drug testing may also deter substance users from applying to become CMV drivers. Additionally, workers who tested positive on pre-employment drug tests have a higher risk of injury than those who did not.[6] However, pre-employment drug testing may have no effect on injury rates without additional employer drug testing.[31,49] For example, the addition of post-crash testing can lower injury rates, as it adds the component of following up with employees instead of just giving them a window during which they need to be able to pass a drug test to gain employment.[31] Spicer and Miller showed that random drug testing is associated with a decrease in positive drug and alcohol tests.[50] Cashman et al.[51] also found a small but

significant downward trend of work-related injuries with the initiation of random drug testing (−0.19 injuries/100 person years) and an immediate significant drop after the initiation of random alcohol testing, though that effect did not continue over time.

EAPs that offer treatment for substance use have been shown to significantly decrease injury rates in the workplace, especially those with outside staff assisting in treatment.[52] The return-to-duty process for a CMV driver includes having a face-to-face assessment with the SAP. Following this assessment, the SAP recommends a treatment and/or education plan that is shared with the employer, monitors the driver's progress through the plan, and conducts a face-to-face follow-up evaluation to verify program completion and success as well as to directly observe follow-up testing. Though this return-to-duty process is not exactly the same as an EAP, it may result in similar reductions in injuries and crashes if conducted properly.

One challenge for CMV carriers is their lack of knowledge regarding an applicant's previous drug testing results. Without knowledge of previous drug test results, carriers may hire a CMV driver who failed a drug test the week before but remained sober long enough to pass the current drug test. In this scenario, the current carrier would have no knowledge of the failed drug test just days or weeks prior; thus, the driver would face no ramifications of the previously failed test and would not be required to go through the return-to-duty process. In fact, this change in employment would be beneficial to the driver, as the return-to-duty process might lead to months of work loss if they are unable to drive until the process is complete. The FMCSA addressed this drug testing loophole by creating the Drug and Alcohol (D&A) Clearinghouse. The D&A Clearinghouse is a central repository that maintains all records of drug and alcohol violations. CMV carriers, SAPs, medical review officers, and/or third-party testing companies are required to enter all positive tests into the Clearinghouse within 3 days of receiving the results. Additionally, carriers are required to query the D&A Clearinghouse for every applicant before allowing them to drive a CMV. Further, carriers are required to query the system annually to determine whether their CMV drivers have any violations that would prohibit them from completing their work tasks.[53]

Drug and alcohol testing in the CMV industry can lead to safer roads for everyone, as well as cost savings for the companies implementing testing and treatment programs. Although adhering to federal regulations and conducting these tests comes with considerable cost, the amount of money saved in injury costs outweighs the costs of testing. One transportation company found the ratio of test cost to savings in injury was 1:26 (a $35 test saved $1,850 in injury cost in 1999).[54] In other words, for every $1.00 spent on drug and alcohol testing, the carrier saved $26.00.

CHAPTER 2. INTRODUCTION OF DRUGS AND THE USE OF DRUGS AND IMPACT ON DRIVING

This chapter describes the major types of illicit drugs and their effect on driving, as well as the effects of alcohol on driving. The drugs included here are those covered by USDOT-mandated drug and alcohol testing. The last section of this chapter provides an overview of prescription and over-the-counter drugs that may adversely impact driving.

ALCOHOL

It is well established that alcohol has a negative effect on driving and increases crash risk.[55,56] A study analyzing BACs from 2006–2008 using data from the Fatality Analysis Reporting System found that alcohol's contribution to crash risk was significantly higher compared to other drug use.[57] Even at low BAC levels (.01 or .02), research shows that alcohol impairs oculomotor function and the ability to divide attention, both of which are essential for the driving task.[7] BACs of .05 or higher lead to greater decrements in skills essential for driving, such as reaction time, tracking, information processing, and other psychomotor skills, which can lead to crashes. One case-control study demonstrated a notable increase in relative risk (RR) for crashes starting at .05 BAC (1.38 RR) and an exponential increase in crash risk starting at .10 BAC (4.79 RR) up until .25 (153.68 RR).[58] The actual level of impairment is also influenced by a number of other factors, including an individual's tolerance, weight, and recent food consumption.[59] Even though alcohol contributes more to crash risk than other drugs, other drugs can also impair driving ability. However, their impact is less clear due to a lack of research with drugs alone (without alcohol, which is often found to be present in combination with drugs).[57] Additionally, if post-crash test results are positive for alcohol, additional drug testing is not often performed.

MARIJUANA

Despite being legal for recreational or medical use in some states, marijuana is still considered a Schedule I drug by the Drug Enforcement Agency under the Federal Controlled Substances Act[60] and is the most commonly used illicit drug in the U.S.[28] According to a meta-analysis of questionnaire data, the overall self-reported prevalence of marijuana use among CMV drivers is much lower than the general population usage rate, 5.9% versus 15.9%, respectively.[10,61] Marijuana contains a psychoactive compound called delta-9 tetrahydrocannabinol (THC). Outside of ethanol, THC is the drug most often detected in driver drug tests.[62] Research identified several effects of THC on driving behavior: increased reaction time; significantly decreased driving speed; and impairments in memory, divided attention ability, tracking, and motor functions such as lane positioning.[8,9] However, research is inconclusive on THC's association with crash risk.[63,64,65] Some research found that marijuana does not increase the relative risk of a fatal or injury crash but does increase the risk for property-damage-only crashes by 1.26 times.[2]

AMPHETAMINES

The self-reported rate of amphetamine misuse among CMV drivers is 21.3%, which is over 10 times the misuse rates among the general population.[10,61] Amphetamines are a class of stimulants that includes prescribed drugs, such as Adderall, Concerta, Dexedrine, Focalin,

Metadate, Methylin, Ritalin, and illegally produced drugs that speed up body systems.[13] Some effects from taking amphetamines include enhanced perception and alertness, which may be why amphetamines are so prevalent in CMV drivers, who often work long and monotonous hours.[11] However, there are a number of other effects that could be detrimental to the driving task, including difficulty in keeping attention, lack of coordination, overconfidence in driving skill, impaired ability to safely control a vehicle, and drowsiness as the effects of the amphetamine wear off.[11] Further, studies using a driving simulator showed that amphetamine usage increases improper signaling, signal violations, slow reaction times, and acceptance of smaller gaps for vehicle maneuvers.[66,67] Due to these negative effects on driving, amphetamines increase the risk of being involved in a fatal, injury, and property-damage-only crash 5.17, 6.19, and 8.67 times, respectively, compared to driving without amphetamines.[2]

COCAINE

The self-reported prevalence rate of cocaine use among CMV drivers is similar to that of the general population, at 2.2% and 2.0% respectively.[10,61] Cocaine, like amphetamines, is a central nervous system stimulant drug; however, it is made mainly for nonmedical purposes. Research on low dosage levels of cocaine has demonstrated effects that, like amphetamines, may benefit driving.[68] These effects include reduced fatigue and increased focus, alertness, and mental clarity.[12] However, research has also shown that cocaine use results in such detrimental effects to driving as increased speeding, reduced vehicle control, inattention, poor impulse control, and other high-risk behaviors.[12] Although less so than amphetamines, cocaine increases the risk of being involved in fatal, injury, and property-damage-only crashes by 2.96, 1.66, and 1.44 times, respectively.[2]

OPIATES AND OPIOIDS

The overall self-reported prevalence of opiate/opioid use among CMV drivers (4.3%) is similar to the prevalence of opioid usage among those aged 15–64 (4.2%) in the general population.[10,69] Opiates include prescription painkillers, such as morphine and codeine, which are based on naturally derived opium occurring in poppy seeds. Opioids are partially or fully synthetic drugs made to mimic the naturally occurring opiates, such as fentanyl, methadone, and heroin. These drugs create a feeling of euphoria and relaxation, which can lead to the misuse of the prescribed versions.[13] Opiates can also create unwanted side effects, such as drowsiness, slowed physical activity, and the inability to concentrate, which could impair the ability to drive safely. There is evidence that opiates significantly increase the risk of fatal, injury, and property-damage-only crashes by 1.68, 1.91, and 4.76 times, respectively;[2] however research is inconclusive regarding which driving behaviors are negatively affected by opiates.[70,71,72]

PHENCYCLIDINE (PCP)

The 2018 National Survey of Drug Use and Health reported that 2% of the population aged 12 years or older reported having used a hallucinogen (which includes PCP) within the previous year.[28] The percentage of the CMV driving population that uses PCP is unknown; however, .02% of CMV drivers (1,132) failed their drug test in 2016 due to PCP.[73] PCP is an illicit hallucinogenic and dissociative drug that effects the brain and changes the way that an individual feels and interacts with the world.[74] PCP is often used to lace other drugs, such as marijuana.

Depending on the dose, PCP can create a state of excitation, paranoia, dreamlike states, depression, hallucinations, cataplexy, seizures, and can induce acts of violence.[14,15] Due to a number of ethical barriers, there are few studies that have evaluated the effects of PCP on driving behavior.[75] However, drug testing records from vehicle crashes show that PCP may lead to an increased risk of fatal crashes.[76,77] Dussault et al. conducted a case-control study of drivers in Quebec and found that drivers using PCP were 28.4 times more likely to be involved in a fatal crash than a driver not using PCP.[78,79] However, this study only had four case drivers, so these results should be interpreted with caution.

CHAPTER 3. DRUG TESTING

Alcohol and drug testing can be conducted via breath, oral fluid, urine, blood, or hair. Each of these methods has different advantages and disadvantages based on the level of intrusiveness to the individual being tested, detection time window of the drug, tampering potential, and cost.[16] Breath and oral fluid tests can detect very recent drug use within 5 to 10 minutes of consumption and with little intrusion of privacy, and could be conducted roadside. Thus, they have low refusal rates but do require a trained professional to collect the sample. Urine tests generally have a longer detection window but do not detect the presence of drug metabolites (substances expelled by the body after a drug has been metabolized) until 2 to 5 hours after consumption. Thus, urine tests are suitable for detection of recent usage but do not test for actual impairment at a given time. Urine tests have a low refusal rate but need a private setting for sample collection with supervision due to possible tampering by adding water or chemical substances that can mask the presence of drug metabolites. Blood tests detect recent drug use but require a trained professional and venipuncture, which results in comparatively higher refusal rates. Hair testing requires removal of hair and can give a long drug use history pending hair characteristics; however, most drugs take 5 to 7 days after consumption before they show up in new hair growth.[20] Additionally, hair samples are not always available (subject may have short or no hair), and they have a high rate of refusal due to cosmetic concerns about loss of hair or fear of ethnic biases in results that can occur based on hair type.[80,81] Drug testing using hair can actually test for drug use over an entire year pending hair length; however most laboratories only use enough hair to test for use in the previous 90 days.[20,82] In addition, hair testing is the most expensive option of all the test types. All of these factors should be considered when deciding what type of drug test should be used for a particular situation.

The duration of time drugs remain detectable depends on a person's state of hydration, frequency of drug use, consumption method, quantity of drug used, specific drug used, the laboratory cut-off levels, the metabolites tested, and the type of drug test (e.g., saliva, urine, blood, or hair).[21,83] Often an initial drug screen is conducted first to indicate whether a drug is or is not in an individual's system at a predetermined level. If an initial screening test yields positive results, a confirmatory test is performed which yields specific quantifiable results on the concentration of a drug in an individual's body at that specific time. A longer detection window for measuring drug use can be advantageous in some scenarios but undesirable in others. For example, if an employer is interested in a driver's alcohol or drug use within the past few hours and possible impairment, a test with a short detection time window would be more appropriate since the employer is not interested in drug use several days prior. In addition, a positive result using a test with a longer detection window does not necessarily mean that the individual is under the influence of the drug at that very moment; however, a positive test performed with a short detection window likely indicates the individual is under the influence of, or impaired by, the drug. Likewise, if an employer wants to know if an individual has used any drugs over the last few months, a hair test would be more useful, as other tests may only disclose more recent drug use. Table 1 (Alcohol), Table 2 (Marijuana), Table 3 (Amphetamines), Table 4 (Cocaine), Table 5 (Opiates), and Table 6 (PCP) provide a general overview of the type of tests available for each drug and general information regarding their detection time window, which can vary pending situational circumstances.

Table 1. Alcohol testing type information.

Test Type	Detection Time Window	Recommended Timing
Breath	12 to 24 hours[17]	• Post-crash • Random • Return-to-duty • Follow-up • Reasonable suspicion
Oral fluid	10 to 24 hours[18]	• Post-crash • Random • Return-to-duty • Follow-up • Reasonable suspicion
Urine	10 to 12 hours[22]	• Post-crash • Random • Reasonable suspicion
Urine (EtG)	80 hours[84]	• Not suggested
Blood	6 to 12 hours[19]	• Confirmatory testing for positive alcohol screen
Hair	90 days[26]	• Not suggested

Table 2. Marijuana (THC) testing type information.

Test Type	Detection Time Window	Recommended Timing
Oral fluid	6 to 24 hours[20]	• Post-crash • Random • Reasonable suspicion
Urine	1 to 30 days[22]	• Pre-employment • Random • Return-to-duty • Follow-up
Blood	5 hours[21]	• Random • Confirmation testing for positive drug
Hair	90 days[22]	• Follow-up (in combination with urine)

Table 3. Amphetamine testing type information.

Test Type	Detection Time Window	Recommended Timing
Oral fluid	1 to 48 hours[22]	• Pre-employment • Post-crash • Random • Return-to-duty • Follow-up • Reasonable suspicion
Urine	2 to 5 hours, up to 1 to 4 days[20]	• Pre-employment • Post-crash • Random

Test Type	Detection Time Window	Recommended Timing
		• Return-to-duty • Follow-up
Blood	46 hours[21]	• Post-crash • Reasonable suspicion • Confirmation testing for positive drug screen
Hair	90 days[22]	• Follow-up (in combination with urine)

Table 4. Cocaine testing type information.

Test Type	Detection Time Window	Recommended Timing
Oral fluid	1 to 36 hours[22]	• Pre-employment • Post-crash • Random • Return-to-duty • Follow-up • Reasonable suspicion
Urine	2 to 5 hours, 1 to 3 days[20]	• Pre-employment • Post-crash • Random • Return-to-duty • Follow-up • Reasonable suspicion
Blood	4 to 12 hours[21]	• Post-crash • Reasonable suspicion • Confirmation testing for positive drug screen
Hair	90 days[22]	• Follow-up (in combination with urine)

Table 5. Opiate testing type information.

Test Type	Detection Time Window	Recommended Timing
Oral fluid	1 to 2 days[20]	• Pre-employment • Post-crash • Random • Reasonable suspicion
Urine	2 to 5 hours, 2 to 4 days[20]	• Pre-employment • Random • Return-to-duty • Follow-up
Blood	20 hours[23]	• Post-crash • Reasonable suspicion • Confirmation testing for positive drug screen
Hair	90 days[20]	• Follow-up (in combination with urine)

Table 6. PCP testing type information.

Test Type	Detection Time Window	Recommended Timing
Oral fluid	1 to 2 days[24]	• Pre-employment • Random • Reasonable suspicion
Urine	5 to 6 days[22]	• Pre-employment • Random • Return-to-duty • Follow-up
Blood	24 hours[25]	• Post-crash • Reasonable suspicion • Confirmation testing for positive drug screen
Hair	90 days[22]	• Follow-up (in combination with urine)

Table 7 shows the USDOT-required cut-off levels for each substance.

Table 7. Cut-off levels for each substance included in USDOT-required tests.

Substance	DOT-Required Cut-off Level
Alcohol	0.04% BAC
Marijuana	50 ng/mL for initial drug screen 15 ng/mL for confirmation testing
Amphetamine	500 ng/mL for initial drug screen 250 ng/mL for confirmation testing
Cocaine	150 ng/mL for initial drug screen 100 ng/mL for confirmation testing
Opiate/Opioid	10 ng/mL to 2,000 ng/mL depending on specific drug being tested
PCP	25 ng/mL for both drug screen and confirmation testing

Overall, breath, oral fluid, and blood drug tests are better suited in situations where current impairment is questioned, such as after a crash or reasonable suspicion. A breath or oral fluid drug screen would be taken immediately, followed by a blood sample for confirmation testing if the drug screen came back positive. Urine and hair testing detect longer drug-use windows from the past few days up to 90 days or longer. Urine testing is thus best suited for pre-employment or random testing (although random testing using urine only indicates consumption of a drug at some point recently, not current impairment). Urine may also be useful for follow-up and return-to-duty testing, with the understanding that the results only indicate consumption, not that the worker is currently under the influence or impaired by a substance. However, hair testing will be able to detect any chronic usage over months instead of merely days.

CHAPTER 4. SUGGESTIONS FOR ALCOHOL AND DRUG TESTING

If done efficiently and consistently, drug and alcohol testing in the CMV industry can lead to safer roads and savings for fleets. Each drug test has an initial up-front cost; however, if conducted strategically, drug testing can lead to long-term savings with reduced injury and crash rates and lower turnover and absentee rates. Some drug tests are more suitable than others given a particular scenario. Based on the research discussed in this paper, Table 8 presents the best use cases and advantages and disadvantages of the different alcohol and drug testing methods.

Table 8. Advantages and disadvantages of different methods of alcohol and drug testing.[85,86]

Test Type	Use Case	Advantages	Disadvantages
Breath	Detect current impairment by alcohol only (i.e., not validated for drug use)	1. Easy to administer 2. Can be portable (can be conducted roadside) 3. Detects very recent use of alcohol (consumption 15 minutes prior) 4. Obtain results in less than 1 minute 5. Nonintrusive 6. Collection is directly observed and therefore less susceptible to specimen adulteration	1. Not a direct measure of blood alcohol content but breath alcohol content instead 2. If results are at an unacceptable level during screening, confirmation test must be conducted 15 to 30 minutes after screening test
Oral Fluid	Detect current impairment or recent use	1. Easy to administer 2. Detects very recent consumption (within a few hours of consumption and up until 1 to 2 days after) 3. Collection is directly observed and so less susceptible to specimen adulteration 4. Obtain negative results in 24 to 48 hours and positive results in 72 hours	1. Does not detect drug use from a few days prior 2. Does not detect habitual drug use 3. Short detection window 4. Must observe individual for up to 30 minutes before collecting test sample to ensure a clean sample
Blood	Detect drug concentration in the bloodstream (i.e., confirmation testing for positive drug screens)	1. Collection is directly observed and so less susceptible to specimen adulteration 2. Detects the parent drug, not just metabolites 3. Can detect current impairment by measuring the concentration of the drug in the blood	1. Does not detect drug use from a few days prior 2. Does not detect habitual drug use 3. Invasive collection of specimen 4. Requires trained phlebotomists 5. Strict controls in transport and storage to retain integrity of sample

Test Type	Use Case	Advantages	Disadvantages
Urine	Currently the only drug test allowed for USDOT-mandated testing	1. Inexpensive 2. Easy to perform (i.e., in a private setting, not roadside) 3. Noninvasive 4. Detects past few days (or weeks depending on usage and drug type) of drug use	1. Sensitive gender, observation, and privacy issues for observation of sample collection 2. Highly susceptible to specimen adulteration 3. Often tests for metabolites of drugs, not the substances themselves 4. Results require different interpretation as they show what is left of a drug in the body 5. Cannot measure current impairment or suggest impairment or drug use at a specific time/event (e.g., not suitable for post-crash or reasonable suspicion testing) 6. Does not detect habitual drug use
Hair	Testing for habitual/long-term use	1. Long detection window (up to 90 days) 2. Can detect habitual users 3. Samples can be easily obtained, stored, and transported for testing 4. Less susceptible to specimen adulteration 5. Can be performed postmortem	1. High cost 2. Cannot detect drug use in immediately preceding 5 to 10 days 3. Longer turnaround time to obtain results 4. Unable to use on individuals without hair 5. Possibility of bias due to hair ethnicity 6. Possible environmental contamination

As noted in Table 8, some types of drug testing are more susceptible to tampering than others. One way to decrease the likelihood of tampering is to use direct observation during sample collection. Breath, oral fluid, blood, and hair all have low susceptibility to tampering for this reason. However, oral fluid can be adulterated with food and certain products designed specifically to clear the oral cavity of drug compounds, such as "Test'in ™ Spit n Kleen Mouthwash." These foods and rinses do not destroy the drug compounds but rather attempt to mask the drug. To help ensure that a clean sample is obtained, a drug test administrator may observe the individual for 30 minutes before testing to ensure nothing that could alter the results was consumed.(87)

Urine tests have the highest susceptibility to adulteration. Due to privacy concerns during collection, individuals are alone when providing urine samples for drug tests. Individuals can add

water to dilute their urine drug content, switch their sample for "clean" urine, or add common household chemicals or specially designed chemical compounds to their sample to mask drug content. Commonly used products to adulterate urine drug tests are laundry detergent, table salt, toilet bowl cleaner, and commercial products, such as UrinAid.[88] Adding these chemicals can cause false negative results and invalidate the test. A specimen collector can escort an individual into the bathroom to ensure that nothing is used to adulterate the sample (e.g., soap, water, or swapped sample). Drug testing laboratories are able to detect adulterants in urine samples and render the test invalid; however, they are not able to discern which particular drug the added chemical was intended to mask. If any adulteration is suspected, a direct observation of a urine sample is warranted in order to obtain valid results.

Hair samples for drug testing are not completely immune to adulteration attempts. One method in thwarting hair drug testing is to remove all hair from one's body to avoid collection. Other methods to deter detection include bleaching, adding cosmetics to hair, or washes and shampoos designed specifically for this purpose.[89] However, Quest Diagnostics, a drug testing laboratory, states that none of these methods of adulteration have been able to change the outcome of the hair drug test (positive or negative). In addition, all hair samples are washed in order to minimize possible environmental contamination of samples.[90]

BEST PRACTICES FOR MAINTAINING A DRUG-FREE WORKPLACE

After employing a driver who has passed all the required pre-employment drug testing, each carriers' goal is to keep all employees in the workplace drug-free. Although adhering to the USDOT guidelines regarding required drug testing is one component to create a safe and drug-free workplace, there are additional steps that carriers may take to maintain a drug-free workplace and to improve alcohol and drug testing.[91] SAMHSA further recommends that workplaces have a written drug and alcohol testing policy, employee education on drug misuse, supervisor training on the drug and alcohol policy, and EAPs.[27]

Drug and Alcohol Testing Policy

A clear alcohol and drug testing policy that is easily understood by employees can aid in reducing confusion and resistance to alcohol and drug testing. This policy may clearly define when drug and alcohol testing is warranted and when reasonable suspicion testing will take place. This policy may also include how employees will be transported to and from the testing site in case of impairment and possibly even back to their residence if needed. Providing for transportation in these circumstances is also applicable for post-crash alcohol and drug testing. The policy should also clearly describe the procedures for how random testing takes place (e.g., use of random number generators, matrices, etc.) and percentages of tests needed in order to satisfy FMCSA rules. A well-described alcohol and drug testing policy receives the fewest legal challenges and leads to the most informed employees. A USDOT Best Practices Manual describes several comprehensive drug and alcohol policies from transit fleets.[91] Although these examples are from transit agencies, many (if not all) aspects of these policies are applicable to CMV fleets, and fleets can use these examples to develop their own policies.

SAMHSA recommends that drug and alcohol policies include a statement of purpose, the goals of the program, definitions, and employee expectations, along with a description of what will

happen to employees who violate the policy.[27] The policy statement of purpose should explain the goals of the policy (e.g., adhere to a legal requirement, explain steps should an employee be found to use drugs, establish restrictions on legal substance use) and describe how it was developed, such as through legal advisement, meetings with employees, etc. The policy should also clearly outline the carrier's goals in implementing the drug and alcohol policy, whether to minimize injuries or absenteeism and/or promote a healthy lifestyle, etc. Definitions in the policy should address the specifics of policy execution, such as how substance use is defined for this policy, who the policy refers to, and descriptions of drug testing. It should also clearly lay out the behavioral expectations of employees and explain what procedures are in place to determine whether an employee has violated the policy, and if so, what consequences they may face and any method of appealing a decision of employee violation. Carriers should have various strategies for dissemination of the policy in order to reach the entire employee population efficiently. Employees can be educated on the policy through webinars, employee handbooks, posters, in-person meetings, etc. Organizations should consider how they can support their employees in complying with the policy by offering help for substance-use problems and ensuring confidentiality. In addition, fleets should make clear the consequences associated with violations, and methods for appealing decisions.

Some employers, such as the Houston Metropolitan Transit Authority, attempt to create a drug-free workplace by adhering to a zero-tolerance policy for safety-sensitive positions or among those who perform safety-sensitive job functions. This means that any employee who has a verified positive drug test, a BAC of .04 or higher, or who refuses to take a test will be terminated unless the employee meets an exemption outlined in the alcohol and drug policy and voluntarily goes to rehabilitation. These employees are granted one rehabilitation opportunity in order to retain their position.[91] Such clear and strict consequences of alcohol and drug use aim to curb substance use at the workplace and some research supports that, when the penalty is severe (such as job loss), substance use may be reduced.[92]

Employee Training and Education

Carriers should have alcohol and drug education and training for employees and managers. Educational material can be provided during orientation; however, it can also be displayed openly around the work area in the form of brochures, newsletters, posters, etc. Easy access to information that may help an employee with a drug-use problem should be well-distributed and include national and local resources for a variety of drug-related issues. Training sessions should also be held for individuals to be able to identify situations in which an employee might be under the influence of alcohol or drugs and therefore warrant a drug test. Clear and easy-to-follow flowcharts provided to employers on when to test for drugs in order to be consistent and efficient is also suggested as a best practice for alcohol and drug testing, ensuring sample collection procedures that minimize adulteration of samples and maintain clear testing records.[91]

Employee Assistance Programs

EAPs are offered to help employees with any problem that may affect their ability to perform their job. Issues covered by EAPs range from social and financial issues to substance misuse problems. Some EAPs are specifically focused on alcohol and drug-use problems and are able to assist in employee education, counseling, and substance abuse treatment. Carriers can offer

EAPs in the workplace (good for large operations with a high number of employees), or via external programs through a network system of providers that are convenient to the employee and specialized in the area where the employee needs help.[27]

Random Drug and Alcohol Testing

Spicer and Miller demonstrated that random drug testing is associated with a decrease in positive drug and alcohol tests.[50] Increasing the frequency of random drug testing may lower positive drug and alcohol tests by keeping employees acutely aware they could be tested as frequently as the carrier deems necessary instead of at semi-regular intervals (i.e., randomly tested once within a time frame). SAMHSA reports that random drug testing is the most effective testing to counteract illicit drug use in the workplace.[27]

Although the USDOT recognizes a .04% or higher BAC as the level requiring an employee to complete treatment in order to continue work, they also recognize the need for intervention with a commercially licensed driver who has a BAC between .02 to .039. Any commercial driver with a BAC between .02 to .039 is removed from service for 24 hours and is not allowed to return to work until they have passed an alcohol test with results under .02 BAC. This helps to reduce any effects of an intoxicated employee on the workplace even though they did not reach the BAC limit required to trigger substance abuse help.

Drug and Alcohol Program Evaluation

A properly executed evaluation of an alcohol and drug testing program allows a carrier to determine how well their program is working and to identify areas for improvement. To evaluate a program effectively, a carrier must take a snapshot of their workplace before the program. Information on employee knowledge, morale, productivity, injury, absenteeism, and turnover rates before and after program implementation can be compared to determine any changes likely due to the new program. Evaluations can also uncover areas which can be improved. For example, if a carrier finds that employee knowledge of the program is low, the carrier may choose to focus more on how they are disseminating the information to adequately reach their workforce. Evaluations can also allow carriers to determine if the cost in implementing a program is worth the benefits (if costs and outcomes can be tracked).

SUMMARY

Approximately 22% of employees admit to using drugs or alcohol during work hours.[1,29] Alcohol and drug use at work can have significant negative impacts for employers, leading to increased costs associated with injuries, loss of work, absenteeism, presenteeism, health care, and turnover. Many employers turn to alcohol and drug testing to combat substance use and the negative effects it has on their business.

Drug and alcohol use can have severe negative effects on driving behavior. Although the effect of some drugs on driving is unclear, research demonstrates that alcohol and a number of drugs negatively affect driving speed, reaction times, and attention, which can lead to an increased crash risk. Drug and alcohol testing can deter substance use at work and result in a safer workplace for all employees, or in the case of CMV drivers, the entire driving population. In 2017, drivers with a BAC of .01 or higher were identified in 3.6% of fatal crashes involving

large trucks, and 2.5% of crash-involved drivers had a BAC of .08 or higher.[48] However, only half of all CMV drivers involved in fatal crashes were tested for alcohol and drugs, and 5.5% of those that were tested were positive for at least one illicit drug.

Alcohol and drugs can be tested in a number of ways, with breath, oral fluid, blood, urine, and hair being the most common. Depending on the desired information, each type of test is most beneficial under different circumstances. Information on recent usage and possible impairment is best achieved through tests with a short detection window, such as breath, oral fluid, and blood. Urine drug testing can detect drug usage over the last few days (or weeks depending on the type of drug and how heavily the drug is used) but not possible impairment. Similarly, hair drug testing can detect chronic usage of drugs over months and up to the previous year but does not provide insight into current impairment. These detection windows indicate which tests should be used in a specific scenario. Breath, oral fluid, and blood testing are best suited for after a crash and for reasonable suspicion of current impairment. Urine and hair testing are best suited for pre-employment, random, return-to-duty, and follow-up testing in which a larger window of possible drug use is desired. Although the USDOT still requires urine testing for post-crash or reasonable suspicion testing, other types of drug testing may be better suited in these scenarios. For example, blood or oral fluid would provide insight in actual impairment; however, urine or hair testing only provides information on the presence of the drug metabolite long after the drug's effects wore off.

Drug testing is only one aspect, albeit an important one, of creating a drug-free workplace. Organizations should also consider developing a clear drug policy, educating employees on alcohol and drug use, training supervisors how to behave with employees regarding alcohol and drug use at work, and creating an EAP program.

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