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Drug and Alcohol Involvement in Railroad Accidents

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ABSTRACT: Postaccident testing of railroad employees for drugs and alcohol was performed in 175 qualifying accidents or incidents (events) from April 1987 through March 1988. Initial tests for drugs were performed on urine, and for alcohol on blood. Presumptive positives were confirmed and quantitated using both blood and urine when available. In 42 of these events (24%), at least 1 employee tested positive (6.7% of 736 employees) for drugs or alcohol. A higher proportion of drug or alcohol-positive events, or both, 40 versus 21%, was found when a fatality was involved. In 11 of the 32 fully investigated drug or alcohol-positive events (involving 14 employees), the investigating agencies determined that substance use was determined to be a probable cause of, or a factor relating to, the accident. Cannabinoids, ethanol, cocaine, or multiple-drug use were found in 5, 3, 3, and 3 of those employees, respectively. Detectable drug and alcohol use occurs among railroad employees; occasionally it has resulted in accidents.

KEYWORDS: toxicology, drug use testing, railroads, accidents

The Federal Railroad Administration (FRA) mandatory postaccident toxicological testing rule [*1*] requires that urine and blood specimens be collected for alcohol and drug analysis from specified railroad employees involved in qualifying accidents and incidents (that is, events). This rule resulted from interrelated developments, including the following: a joint labor/management/FRA survey showing that some employees consumed alcoholic beverages just prior to, or while on, duty [*2*]; autopsy findings indicating that, in work-related fatalities, employees frequently were under the influence of drugs or alcohol [*1*]; and growing FRA and societal concerns about drug and alcohol use in an industry that affects public safety.

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Since mandatory postaccident testing has been implemented on the railroads, there are additional federal regulations that require drug testing at several different levels in the transportation industry [*3*]. Data substantiating the extent of substance abuse in the transportation industry are, however, limited to a single study on drug and alcohol levels in truck drivers who volunteered for testing [*4*] and to a report on random drug testing results from a single railroad company [*5*]. Available surveys estimate societal use of drugs, but provide little data on the presence of drugs in on-the-job workers [*6,7*]. Studies available on substance abuse and transportation generally address driving irregularities [*8–10*] and fatal traffic incidents [*11–15*]. While these confirm the hazard to our population that arises from alcohol and drug use while driving, these incidents are related to private transportation and do not address the extent of the hazard of substance abuse in public and industrial transportation. The FRA's testing program, while intended primarily to evaluate the contribution of drugs or alcohol to railroad accidents, also provides data on the occurrence of drug and alcohol use in a segment of transportation employees.

This report summarizes the findings from the first year of testing conducted in our laboratory. These analytical results have been correlated with investigative reports generated by the FRA and National Transportation Safety Board (NTSB). A preliminary report which contains many of the same findings has been published in a conference proceedings [*16*].

Methods

Criteria for Testing

Railroad companies must report all accidents that result in damage to railroad property exceeding a semiannually adjusted reporting threshold ($5200 for 1987) and those incidents (no damage threshold required) that result in certain work-related injuries to railroad employees. A train accident is defined as "a collision, derailment, or other event involving the operation of railroad on-track equipment resulting in damages that exceed the reporting threshold." A train incident is defined as "any event involving the movement of railroad on-track equipment that results in a death, a reportable injury, or a reportable illness, but in which railroad property damage does not exceed the reporting threshold." An injury is defined as "physical harm which requires treatment beyond first aid, causes at least one day of absenteeism from work, or results in restriction of the employees' work performance" [*17*].

Mandatory drug and alcohol testing is required in three categories of specified events: first, train accidents, as defined above, that are of substantial public interest, or "major train accidents," including those resulting in a fatality to a railroad employee, the release of hazardous material with accompanying injury from the released product or evacuation, or damage to railroad property in excess of $500 000; second, accidents involving collision with on-track equipment, or "impact accidents," resulting in damage to railroad property of $50 000 or more or a reportable injury; and third, any fatality involving an on-duty railroad employee involved in a train incident (Table 1) [*1*]. Supervisory railroad officials must make a good-faith estimate of injuries and damage at the scene of an event to determine if it meets the criteria for testing. In general, all crew members are tested. In addition, other "covered" employees (that is, those employees performing service subject to the Hours of Service Act [45 U.S.C. 61-64b]) involved in the circumstances of the accident/incident, such as dispatchers and signal maintainers, must also be tested. Testing of "noncovered" employees is performed only if they are fatally injured in the course of a qualifying event. For impact accidents and fatal train incidents (but not major train accidents), employees may be excused from testing if it is immediately determined, and can be documented, that they had no role in the direct cause of the accident [*1*]. The

"external chain-of-custody" forms submitted with the specimens were used to determine the test-initiating criteria, the number of employees tested, the time of the event, and the time of specimen collection. Requirements of individual privacy precluded inclusion of information on the age, sex, and race of the employees tested on these forms.

Collection of Specimens

The FRA requires that testing be carried out at an independent medical facility as soon as possible after the accident or incident, but that this is not to preclude necessary involvement of the employee or employees in duties regarding the preservation of life or property [*1*]. Both blood and urine specimens are routinely collected from railroad employees. Tissue specimens were requested from the coroner performing autopsies on the fatalities. Blood was collected in 12-mL vacutainer tubes containing sodium fluoride and potassium oxalate, and urine was collected in 100-mL plastic bottles containing 1 mL of 1% sodium fluoride. The specimens were labeled, initialed by the employee, and secured with evidence tape. The specimens were then packaged in one or more Styrofoam shipping containers, each of which contained a can of ice, and shipped by overnight courier to our laboratory.

Analysis of Specimens

The initial tests of specimens involved immunoassays of the urine for drugs of abuse, and gas chromatography (GC) examination of the blood for ethanol, using previously described methods [*18*]. Urine (blood or tissue if urine was not available) was initially tested for the following drug groups at the screening cutoffs given in parenthesis: amphetamines (300 ng/mL), barbiturates (200 ng/mL), cannabinoids (20 ng/mL), cocaine metabolite (300 ng/mL), methaqualone (750 ng/mL), opiates (300 ng/mL), and phencyclidine (25 ng/mL) by radioimmunoassays (Abuscreen® reagents), and for benzodiazepines by enzyme-mediated immunoassay (EMIT® reagents). Initial tests of tissue or blood for benzodiazepines were performed by GC with electron capture detection (GC/ECD). Blood specimens (urine or tissue if blood was not available) were initially tested for ethanol (0.01 g/100 mL) by GC/flame ionization detection (FID). If the initial test was positive, then the ethanol content was confirmed and quantitated in the blood and urine, and tissue when provided. Confirmation was performed by GC/FID, but with an alternative column packing material.

When urine or other tissue was presumptively positive based upon the initial test, both the blood and urine specimens, if available, were subjected to further testing to confirm and quantitate the presence of the suspected drug, drugs, or drug metabolites. Confirmation and quantitation of presumptive positive specimens were performed for the following specific drugs and metabolites using the lower limits (cutoffs) for blood and urine given in parenthesis. The cutoff concentrations were the same for blood and urine unless specified otherwise. Cocaine (50 ng/mL) and benzoylecgonine (50 ng/mL, blood; 150 ng/mL, urine) were determined by GC/positive chemical ionization (PCI) mass spectrometry (MS), as previously described [*19*]. Delta-9-tetrahydrocannabinol (THC, 1 ng/mL) and carboxy-THC (2 ng/mL) in blood were determined by GC/negative chemical ionization (NCI) MS, as described by Foltz et al. [*20*]. Carboxy-THC in urine (20 ng/mL), and amphetamine and methamphetamine (100 ng/mL), unconjugated morphine and codeine (100 ng/mL), methaqualone (500 ng/mL), and phencyclidine (25 ng/mL) in blood and urine were determined by GC/PCIMS, essentially as described by Foltz et al. [*21*], with the substitution of fused silica capillary columns for packed columns. Diazepam and flurazepam, and chlordiazepoxide (300 ng/mL) were quantitated by high-performance liquid chromatography (HPLC) and GC/electron capture detection (ECD), respectively,

as described by Peat and Kopjak [*22*]. Pentobarbital, secobarbital, amobarbital (200 ng/mL), and phenobarbital (1000 ng/mL) were quantitated by HPLC, as described by Adams et al. [*23*] and Kabra et al. [*24*], with confirmation of benzodiazepines and barbiturates by GC/electron impact (EI) MS.

Relationship of Drugs or Alcohol to Accident/Incident Causation

The data accumulated in this laboratory in regard to the FRA's testing program were not sufficient to make a determination of the role of drug or alcohol use in accident causation. Such a determination requires more detailed study in which laboratory reports are an essential, but not the sole, consideration. A majority of the events, including all fatal events, which had drug- or alcohol-positive reports, however, were investigated in a more thorough fashion by the FRA, the NTSB, or both. At this time, the majority of these investigations have been completed for the period of study covered in this report. Because of public interest in the results of these investigations, they have been summarized and correlated with the presented laboratory findings.

Both the FRA and the NTSB make statutory probable-cause determinations for those accidents that they investigate. In accidents involving human factors, employee-fitness considerations may be treated as contributing factors, with primary emphasis placed on the unsafe act leading to the accident in question. Alcohol and drug use is identified as having a causative relationship for purposes of this paper if the FRA determined that such use was the primary probable cause of the accident, a contributing cause, or at least sufficiently prominent as a risk factor to be identified as a possible contributing factor by virtue of (1) the culpability of the employee testing positive with respect to the accident cause or severity and (2) the compatibility of the acute or aftereffects of the drug with the exhibited behavior. The relationship of drug or alcohol use to accident causation was taken from FRA [*25–27*] and NTSB [*28*] investigation reports. (Evaluation of the events occurring in 1988 was made from NTSB reports NTSB/RAR-89/01 and NTSB/RAR-89/02 and from NTSB *Briefs of Accident* Nos. DEN88FR006A, FTW88FR012, NYC88FR012A, and CHI88FR016A). The number of cases related to accident causation included cases in which substance use was ruled to be one of the probable causes or related to the cause of the accident by one or both of the federal agencies.

Results

Qualifying Events

From 1 April 1987 to 31 March 1988, 175 accidents and incidents qualified for testing. Within the major classifications, major train accidents, impact accidents, and fatal train incidents accounted for 50.3, 38.3, and 11.4% of the events, respectively (Table 1). These major categories were exclusive, with no overlap. Furthermore, no overlap occurred in the distinction between fatal and nonfatal events which were used for later evaluations. Within these major categories, the testing criteria were categorized based upon key events, and some overlap may have occurred. That is, while a major train accident with a fatality does not also require $500 000 in damage to trigger testing, the fatality would override either the $500 000 in damage or hazardous-material release for final classification. In a similar fashion, injury would override damage estimates for classification of impact accidents. Therefore, the test-initiating criteria represent true classifications insofar as they identify major criteria which trigger mandatory drug and alcohol testing. The key term distinguishes these criteria from others, and it is legitimate to look for statistical differences among these categories. We have limited this correlation solely to data obtained on the "chain-of-custody" forms, which have been presented in Table 1.

TABLE 1—*Number of events and employees tested based on criteria for testing and the time required for the collection of specimens.*

Test Initiating Criteria	No. of Events	No. of Employees Tested	Time Between Event and Specimen Collection, h	
			Mean ± SD	Range
Major train accidents with				
Fatality[a]	10	68	5.08 ± 1.48[b,c]	2.25–7.25
Damage in excess of $500 000	62	267	5.79 ± 1.67[c]	2.25–9.25
Release of hazardous material with evacuation	16	71	5.36 ± 1.57[b,c]	2.75–10.25
Impact accident with				
Damage in Excess of $50 000	36	142	5.20 ± 1.76[b,c]	2.75–10.75
Reportable Injury	31	130	4.76 ± 2.15[b]	1.25–12.75
Fatal train incident[a]	20	58	5.54 ± 1.42[c]	2.25–7.75
Total	175	736	5.36 ± 1.79	1.25–12.75

[a]Specimen collection times in fatal events are for the surviving employees only.

[b,c]One-way analysis of variance (ANOVA) of the specimen collection times demonstrated that all values were not equal with $P < 0.05$. Values found to be significantly different ($P < 0.05$), as determined using the Tukey test for groups of unequal size, do not share the same letter in the footnote.

In this regard, the 175 events resulted in testing of 736 railroad employees (700 survivors and 36 fatalities) with an average of 4.2 and a range of 1 to 11 employees tested per event. The average number of employees tested per criterion ranged from 2.9 in fatal train incidents to 6.8 in major train accidents with fatalities (Table 1); the latter category had significantly greater numbers than the other six, resulting, in part, from differences in the number of crews involved per major train accident and in the potential exclusion of employees from testing in the impact accidents and fatal train incidents.

Duration of Time to Specimen Collection

The length of time between the event and the collection of specimens is of critical importance in the interpretation of toxicological findings. The collection times available for 82.8% of the employees not fatally injured ranged from 1.25 to 12.75 h (average, 5.36 h) (Table 1). The delay in the collection time for impact accidents with injury was significantly less than that for major train accidents with damage or that for fatal train incidents (Table 1). The time difference between categories may result from a variety of factors, such as the distance from the accident site to a medical facility, the time required for emergency work, and the time required for establishing the necessity of testing. Specimens collected from fatalities were generally obtained at medical examiner facilities, where the time lapse until autopsy (data not shown in Table 1) ranged from 2.5 to 48.5 h (average 15.9 h). The total specimens collected were from 591 individuals involved in 145 nonfatal accidents, and 145 individuals, including 36 fatalities, involved in 30 fatal accidents/incidents. Blood and urine specimens were received from 708 individuals, including 20 fatalities; 28 employees had testing restricted to blood, urine, or tissue only.

Drug and Alcohol Findings

Twenty-four percent of the 175 qualifying events had at least 1 individual test positive for alcohol or drugs (Table 2). The majority of drug- or alcohol-positive events arose from a single employee testing positive for a single substance. There were, however, 8 events in which employees were positive for more than one substance or more than 1 employee tested positive (Table 2). The total for the year of 42 positive qualifying events was associated with 49 positive employees and with 53 positive drug or alcohol findings. Of the 49 positive employees, 4 were positive for medications which had been properly documented as prescribed. All 4 of these fell within the category of positive events with a single individual positive for a single substance. Of the 3 positive findings encountered for fatalities, 1 involved a prescribed medication. In total, of the 700 surviving employees tested, 46 (6.6%) were positive for one or more substance, with 43 (6.1%) positive for nonprescribed drugs or alcohol. Of the 36 fatalities investigated, 3 (8.3%) were positive for a single substance, 2 (5.6%) for nonprescribed drugs or alcohol. For this small number of cases, there was no statistical difference in the proportion of positives between the fatal and surviving employees when either the total positives ($\chi^2 = 0.14$, $df = 1$, $P < 0.75$) or only the illicit positives ($\chi^2 = 0.015$, $df = 1$, $P < 0.90$) are considered.

Cannabinoids were the most commonly detected single drug (4.1% of all individuals tested), with cocaine or the cocaine metabolite, benzoylecgonine (0.68%), ethanol (0.68%), and opiates (0.41%) also detected. Benzodiazepines were found in 2 employees, while amphetamines and methaqualone were each detected in a single individual (Table 3). In addition, 3 employees tested positive for multiple drugs (Table 3). In all the positive cases but one, the urine specimens were positive at reportable concentrations for the drug groups mentioned above. The number of positive findings in the blood varied with the drug group. For example, delta-9-tetrahydrocannabinol (THC) and its carboxy-THC metabolite were detected in the blood of 12 and 30 of the 32 employees, respectively, who tested positive for cannabinoids (Table 3). Benzoylecgonine and opiates were detected in the blood of only 2 and 1 of the employees, respectively, who were positive for these drug groups, while all employees who tested positive for ethanol, benzodiazepines, methaqualone, and barbiturates had positive blood findings. In part, this reflects the differences in pharmacokinetics of the various drugs, as well as consideration of many undetermined parameters, such as the time between the dose and specimen collection and individual variations in pharmacokinetics [*29*]. Detection of a drug, its metabolite,

TABLE 2—*Summary of the number of positive findings.*

Positive Classification	No. of Events	No. of Individuals	No. of Drugs Identified
Single individual with			
Single-drug group	34	34	34
Multiple-drug groups	2	2	4[a]
Multiple individuals with			
Single drug per individual	5	11[b]	11
Multiple drugs per individual(s)	1	2	4[c]
Total	42	49	53

[a]Each individual positive for 2 drug groups.
[b]Four events with 2 positive individuals, 1 with 3.
[c]One individual positive for 3 drug groups.

TABLE 3—*Summary of the positive results and causal role in the accident.*

Drug Group	Number Identified		Number Investigated	Number Related to Accident	
	Total	Blood Positive		Total	Blood Positive
Cannabinoids	30	29 (12)[a]	22	5[b]	5 (4)[a]
Cocaine	5	2	4	3	2
Opiates	3[c]	1	3	0	0
Ethanol	5	5	4	3[b]	3
Benzodiazepines	2[d]	2	2	0	0
Methaqualone	1	1	1	0	0
Barbiturate and opiate	1	1 of 2[e]	1	1	1 of 2[e]
Cannabinoid and *cocaine*	1	1 of 2[e]	1	1	1 of 2[e]
Cannabinoid, cocaine, and amphetamine	1	1 of 3[e]	1	1	1 of 3[e]

[a]Positive for blood delta-9-tetrahydrocannabinol (THC).
[b]One of the cannabinoid, and one of the ethanol positives associated with accident causation are from the same event.
[c]Three of the positive opiates were prescribed medication.
[d]One of the positive benzodiazepines was prescribed medication.
[e]The single-drug group detected in the blood is in italics.

or alcohol in an individual's body fluids or tissue does not necessarily imply, however, that drug or alcohol use played a part in the accident causation.

Role of Drugs or Alcohol in Accident/Incident Causation

Determination of probable cause in railroad accidents and incidents is under the dual authority of the FRA and NTSB. Not all events qualifying for mandatory postaccident testing were investigated. However, in those with positive drug or alcohol findings, particular attention is paid to the potential causal role of substance use. Of the 42 positive events, 32 events, involving 38 drug- or alcohol-positive employees, have currently undergone a thorough investigation, 19 by both the FRA and NTSB, 4 solely by the FRA, and 9 solely by the NTSB. Of the 38 positive employees investigated, substance abuse was determined by one or both of the agencies to be a probable cause of, or a factor relating to, the accident in 11 and 3 employees, respectively [*25–28*]. A small proportion of cannabinoids (22.7% of the investigated cannabinoid-positive incidents) was associated with employees involved in accident causation, when compared with cocaine (75%) and ethanol (75%). While only 3 employees were found positive for multiple drugs, it is notable that, in all 3 cases, the use of drugs was found in a key individual (Table 3).

Twenty-four percent of all the qualifying events had at least one employee who tested positive for alcohol or drugs. When the events were separated into fatal and nonfatal, a significantly higher proportion of fatal events had drug or alcohol-positive employees (40%) than the nonfatal events (20.7%) (Table 4). All the positive events with fatalities were investigated to determine the causal role of substance abuse, and in 25% of these (10% of all fatal events), it was determined that substance use was a probable or related cause of the accident. Although only 20 of the 30 positive nonfatal events have undergone finalized investigations, 8 of the 20 investigated events involved substance use as a probable cause of the accident (Table 4). With 10 of the nonfatal positive events not investigated, the proportion of all such events in which substance used played a causal role cannot be accurately determined. However, consideration of the extreme cases, in which either none or all of the 10 cases had substance use as a causal factor gives a range of 13.8 to 20.7%. Therefore, while positive findings as a whole occurred more frequently in fatal events, they were not determined to be causal more often than in nonfatal events.

TABLE 4—*The relationship of positive drug and alcohol findings to accident causation in fatal versus nonfatal events.*

Occurrence	Fatal Events	Nonfatal Events	Total Events
Total events	30	145	175
Positive events[a]	12	30	42
Investigated positive events	12	20	32
Investigated events with substance use related to accident causation[b]	3	8	11

[a]Comparison of total positive fatal versus nonfatal events: $\chi^2 = 4.08$, $df = 1$, $P < 0.05$.
[b]Comparison of investigated fatal versus nonfatal events deemed causal: $\chi^2 = 0.81$, $df = 1$, $P < 0.5$.

Discussion

The results of this study clearly demonstrate that there are railroad employees who have consumed, ingested, or been exposed to alcohol or drugs prior to, or subsequent to, reporting for work. In a small—but important—number of cases, Federal investigations suggest that drug use played a causal role in the accidents. Several factors must be considered in interpreting these results.

The population studied was restricted to individuals connected with defined qualifying events. This cannot be construed as a random sampling of "covered" railroad employees, but is restricted to those involved in train accidents or incidents which qualified for this level of testing. It is of interest, though, that a single report of random testing of employees from a single railroad company, during the same time frame, yielded similar rates of positive employees [*5*]. Furthermore, in some cases not all crew members or associated employees were tested. While exclusion of employees from testing required documentable evidence that they were not involved in the circumstances leading to the accident or incident, we do not know if some of the excluded employees would have tested positive for drugs or alcohol under the conditions of this testing program, and if so, if they would have altered the percentages of the results. Although approximately half of the events (50.3%) were major train accidents which required testing of all associated employees, this exclusion probably contributed to the lower number of employees tested per "nonmajor" event so that only 44.8% of the employees were from this category. It should be noted that if we look at the positive rate of employees in "major" (6.2%) versus "nonmajor" (6.4%) events, there was no significant difference ($\chi^2 = 0.012$, $df = 1$, $P < 0.95$). With these limitations in mind, we can say that these data do reflect drug and alcohol findings among employees who may have been involved in accident causation.

The association of substance use with accident causation is a complicated process in which several variables must be considered, including laboratory findings of tissue drug or alcohol concentrations. Even if a single individual can be identified as being responsible for the accident, determining whether that individual was impaired is not a straightforward process. The laboratory findings provide data on the concentrations of drugs, drug metabolites, or alcohol detected in blood, urine, or tissue specimens taken at a specific time after the event. Extrapolation of these levels back to the time of the event may be attempted, but there are uncertainties due to large individual differences in the pharmacokinetics of the different drugs [*29*]. For example, it is well established that the half-life for excretion of THC and its primary metabolite COOH-THC can vary widely, depending upon the past use history of the individual [*30,31*]. More recently, it has also been noted that cocaine metabolite can be detected in urine for much longer time periods than would be estimated from the pharmacokinetic models [*32,33*]. Even with a reliable estimate of the drug or drug metabolite concentrations at the time of the event, there is

currently no consensus, with the exception of ethanol, on what concentrations are indicative of impairment. However, a consensus was expressed that "taken in conjunction with clinical observations and circumstantial evidence, [the drug concentrations] help either to support or exclude a diagnosis of impairment due to a specific drug" [*34*].

In automobile or trucking accidents, where a single driver is often involved, it may still prove difficult to ascertain the individual's role in causation. This is further complicated in railroad accidents, where several individuals may have responsible duties impacting on proper performance. Therefore, for the purposes of this study, we have drawn upon the reports of federal investigative bodies to correlate laboratory findings with the potential role of substance use in accident causation. While we do not have sufficient information to present the methodology employed to reach these conclusions, it can be stated that the investigations strive to determine (1) if human performance failure was involved in the accident, (2) if a single individual or multiple individuals were responsible for this failure, and (3) if the circumstances, which include the laboratory findings, are consistent with substance use being a factor in the human performance failure.

At this time, only 32 railroad accidents or incidents with drug or alcohol-positive employees detected from this study (76% of the positive events) have been fully investigated. While this may be considered a small study population, important trends are apparent. First, a number of railroad accidents can be attributed to employees' drug or alcohol use. The provisional data reported here indicate that 11 railroad accidents in one year were attributed to substance use. While the impact of these accidents on human life and property is large, the percentage attributed to substance use is much smaller than that seen in automobile accidents [*11–15*]. Also, in contrast to its role in automobile accidents, alcohol use, while prominent, was not the most common contributing factor. Cannabinoid, cocaine, or multiple-drug use were seen as contributing factors equally as often as ethanol. Whether this arises from the relative ease with which co-workers can detect alcohol use in comparison with drug use cannot be ascertained at this time.

Although from a selected population of the railroad industry, these data offer an estimate of the number of employees associated with accidents and incidents who have detectable drugs, drug metabolite, or alcohol in their system while at work. The extent of alcohol and drug findings is, however, much less than that indicated by a 1978 survey of on-the-job alcohol use by railroad employees [*2*] and current surveys of drug use among the working-age population [*6,7*]. Population surveys do not, however, reflect the proportion of employees who maintain detectable drugs, or metabolites, in their systems while on the job. Furthermore, the proportion of drug- and alcohol-positive tests is strikingly different from that encountered in fatally injured automobile drivers or those apprehended for erratic, unsafe driving. In these latter studies, ethanol was the drug found predominantly, with cannabinoids and benzodiazepines also commonly detected [*8–15*].

Random testing of truck drivers during working hours offers a potentially more realistic comparison with railroad employees and demonstrates a similar general ranking of positive drug and alcohol findings, with cannabinoids, the drugs most used, followed by ethanol and cocaine. The percentage of positive specimens, however, was consistently higher in the truck drivers [*4*]. Opiates (mostly prescribed medications) were more common among the railroad workers, in contrast to amphetamines, which were more common in the truck drivers. Differences between the findings for railroad workers and those for truck drivers may, arguably, arise from the prolonged time occasionally required for specimen collection in the railroad postaccident testing. This would decrease the likelihood of detection of more rapidly cleared drugs, such as alcohol, as opposed to slowly cleared drugs such as the carboxy-THC metabolite [*27*]. Ninety-three percent of the railroad workers tested under the mandatory postaccident guidelines did not have reportable levels of the drugs or alcohol monitored under this program. The small per-

centage which were positive, their role in fatal accidents, and the public nature of this industry are matters of concern.

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