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Special Issue

Recommendations for Toxicological Investigation of Drug-Impaired Driving and Motor Vehicle Fatalities

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This report describes the review and update of a set of minimum recommendations for the toxicological investigation of suspected alcohol and drug-impaired driving cases and motor vehicle fatalities involving drugs or alcohol. The recommendations have the goal of ensuring that a consistent set of data regarding the most frequently encountered drugs linked to driving impairment is collected for practical application in the investigation of these cases and to allow epidemiological monitoring and the development of evidence-based public policy on this important public safety issue. The recommendations are based on a survey of practices in US laboratories performing this kind of analysis, consideration of existing epidemiological crash and arrest data and practical considerations of widely available technology platforms in laboratories performing this work. The final recommendations were derived from a consensus meeting of experts recruited from survey respondents and the membership of the National Safety Council's Alcohol, Drug and Impairment Division (formerly known as the Committee on Alcohol and Other Drugs, CAOD).

Introduction

Increasing attention is being paid to the issue of drug impaired driving in the USA and around the world. Between 2006 and 2009, the European Union funded the Driving Under the Influence of Drugs (DRUID) project, a collaboration of 37 institutions in 19 countries, amassing convincing findings from over 50 epidemiological, behavioral, roadside survey and technology evaluation studies concerning the relationship between drug use and driving impairment (1). Many of the findings from DRUID and its predecessors are now being addressed in Europe in the form of policy and legislative reform, including the expansion of roadside oral fluid testing, drug categorization for consumer and dispenser education and zero-tolerance laws for illicit drug use. In the USA, a National Roadside Survey of drug and alcohol use by drivers was conducted in 2007 (2). The survey included the collection of blood and oral fluid samples from 5,000 subjects, which were analyzed for the presence of drugs. This study brought the high incidence of potentially impairing drug use in the driving population to the attention of the public and policy makers. A follow-up, case-controlled crash risk study is in progress. A 2006 report on drug use in fatally injured drivers in Washington State (3) demonstrated high positivity rates for drug use in fatally injured drivers. This study found central nervous system (CNS)-active drugs in 39% of fatally injured drivers. CNS depressants including carisoprodol, diazepam, hydrocodone, diphenhydramine, amitriptyline and others were detected in 14.1% of cases. Cannabinoids were present in 12.7% of cases, and CNS stimulants, including cocaine and amphetamines, in 9.7% of cases. Logan and Barnes (4) described rates of drug and alcohol use by suspects in vehicular assault and vehicular homicide cases, demonstrating that 65.4% of suspects were positive for alcohol use, while 50.1% were positive for drug use. Moreover, of the alcohol-positive cases, 51.3% were additionally positive for drug use. Other evidence that the prevalence of drug use in drivers is significantly under-reported when alcohol use is involved was shown by Limoges *et al.* in 2009. In that report, DUI cases in which only alcohol testing was requested, but on which drug testing was subsequently performed, 40% of the alcohol-positive drivers were presumptively positive for drugs (5). In 2012, the National Highway Traffic Safety Administration (NHTSA) issued a report proposing guidelines for standardization in the evaluation of both therapeutic and abused drugs to allow better informed prescribing practices and public education (6).

Other groups have also called for more attention to the drugged driving issue, in particular demanding better practices and standardization of analytical toxicology procedures. In 2010 and again in 2012, the National Governors Highway Safety Association (NGHSA) called for the evaluation of the feasibility of establishing national standards for various controlled substances involved in drug-impaired driving (7). In 2010, the US Office of National Drug Control Policy (ONDCP) issued its national strategy for drug demand reduction, and for the first time included drug-impaired driving as part of that strategy. In 2012, the ONDCP made a similar recommendation in its National Drug Control Strategy (8) calling for the development of standardized screening methodologies for drug testing laboratories to use in impaired driving investigations. In addition, the ONDCP plan calls for the implementation of oral fluid testing as a tool to aid impaired driving enforcement. In November 2012, the National Transportation Safety Board (NTSB), an independent federal agency charged by Congress with investigating every civil aviation accident in the USA and significant accidents in other modes of transportation including railroad, highway and marine, called on NHTSA to support the development of standard practices for drug testing in transportation accident investigations (9). NHTSA itself has identified a weakness in the key epidemiological tool it uses to track alcohol and drug involvement in traffic fatalities. The Fatality Accident Reporting System (FARS) reflects the fact that drug-use data are either not generated or not reported in ~70% of traffic fatalities (10). The data have further limitations based on the fact that among those states

reporting drug data, the scope and sensitivity of testing between laboratories is highly variable. Hingson *et al.* (11) have emphasized the value of the FARS data set for interpolating rates of drug use in fatally injured drivers from data in states where testing is most comprehensive; however, at least one of these states (Maryland) does not test for marijuana use.

Collectively, these factors all point to both the prevalence of drug use in the driving population and the limitations of the current approaches to testing and reporting. The limitations result in difficulties in consolidating reporting of the results into a meaningful epidemiological database. These limitations also impede concise and consistent descriptions of the scale and nature of the drug-impaired driving problem in the USA and have consequently slowed the process of bringing resources to bear on assessment, public education and further enforcement of drug impaired driving.

The forensic toxicology community has not been idle in promoting initiatives to address shortcomings in these data-collection systems. Their resources, however, are stretched, and frequently take second place to other forensic science reform and service objectives. In 2000, the American Academy of Forensic Sciences (AAFS) and the Society of Forensic Toxicologists (SOFT) formed a joint Drugs and Driving Committee to promote education and research on the drug-impaired driving issue. These organizations have subsequently provided training in this subject area twice a year at their respective annual meetings. The Drug Recognition Expert (DRE) program was established by NHTSA in 1988 and is managed by the International Association of Chiefs of Police (IACP). This is a structured program for law enforcement officers to use in assessing suspected impaired drivers for indicators of drug use. The officer systematically collects and documents the symptoms of drug use and impairment, and ultimately obtains a chemical test of a biological fluid to identify the nexus between the observed signs and symptoms and the substances ingested.

In 2004, a NHTSA working group issued a prioritized list of drugs of concern in impaired driving cases (12), and also in 2004, in conjunction with the National Safety Council's CAOD, NHTSA sponsored a meeting of toxicologists, DRE officers and prosecutors to promote the harmonization of resources and priorities for the investigation of drug-impaired driving cases (13). This led to a survey of practices in toxicology laboratories and to the publication in 2007 of recommendations for toxicological investigations of drug-impaired driving including a proposed scope of testing and analytical cutoffs for blood and urine (14). These recommendations were the result of deliberations of a consensus panel of forensic toxicologists, who evaluated factors including known prevalence of drugs in impaired driving casework, and the analytical capabilities of the state, local, academic and private laboratories most frequently involved in this type of testing. In 2007, a separate consensus document prepared in anticipation of the DRUID studies arrived at largely consistent conclusions in terms of the drugs at greatest risk of causing driver impairment (15). The DRUID recommendations also included guidance for the implementation of oral fluid drug testing, whose utility was further evaluated with positive outcomes in the course of the DRUID project (16).

In 2012, the National Safety Council's CAOD undertook a re-survey of toxicology laboratories in order to assess the impact of the 2007 recommendations and to evaluate changes in the landscape of drug use by drivers. This report provides results pertaining to drug prevalence among the participating laboratories and provides recommendations for screening and confirmatory testing scope and cutoff concentrations in blood, urine and oral fluid.

Methods

Forensic toxicology laboratories, identified by the two major US professional organizations in forensic toxicology (AAFS and SOFT), were canvassed as to whether they performed testing in suspected drug-impaired driving cases. A total of 123 laboratories identified themselves as forensic science service providers in this area. They were sent an invitation to complete a survey (SurveyMonkey™) regarding their testing practices and the use of their results in the criminal justice system. Follow-up calls were made to the laboratories to encourage them to complete the survey, and eventually a total of 96 laboratories provided sufficient information to be included in the analysis. The survey included questions regarding status as a public, private, academic or hospital laboratory, turnaround time and workload data, sample matrices that are tested and screening and confirmatory procedures. Additional questions regarding staffing, involvement in training and material needs were also asked. The person completing the survey was provided with a copy of the 2007 recommendations for drug testing in impaired driving cases (14) and was asked to indicate whether their laboratory was in compliance with the 2007 recommendations in terms of scope and sensitivity, and if not, what barriers prevented the adoption of these standards. The data were analyzed, tabulated and then shared with a subset of laboratory directors, representing state, county, city, private and academic laboratories. This subset was resurveyed with additional questions regarding specific analytical practices for screening and confirmation, and prevalence of drugs in their impaired driving populations. Various publications were reviewed regarding the frequency, prevalence and concentration data for drugs detected in arrested (17), injured (11) and fatally injured driver (10) populations. These data were tabulated, along with the therapeutic concentrations, which were reviewed for the drugs identified in the above sources (18). The oversample participants were invited to attend a 2-day consensus meeting, where the 2007 recommendations and the survey and literature data were reviewed. Laboratory access to various analytical technologies was also considered. Based on the above considerations, the group arrived at a consensus on approved sample matrix types, an approach to scope of testing, appropriate cutoff concentrations for analysis and recommended analytical philosophy. The results are discussed below.

Results

Prevalence

Table I summarizes the number of laboratories that listed each drug or drug class in their top 20 most frequently encountered drugs. For drugs exhibiting an equivalent frequency, they were further ranked according to the total number of positive results in the last 12 months, with the largest number of positive results being ranked highest. THC and/or metabolites were reported in the top 20 for all the 13 of the surveyed laboratories, with a total

Table I
Frequency of drug appearing in top 20 most prevalent drugs in oversampled laboratories ($N = 13$)

Compound	Number of laboratories reporting this compound/class in their top 20
THC and metabolites	13
Alprazolam/alpha-hydroxyalprazolam	13
Diazepam/nordiazepam	13
Cocaine and metabolites	13
Morphine	13
Oxycodone	12
Hydrocodone	12
Carisoprodol/meprobamate	11
Zolpidem	11
Methamphetamine	9
Clonazepam/7-aminoclonazepam	9
Amphetamine	9
Methadone	9
Lorazepam	9
Codeine	7
Diphenhydramine	6
Tramadol	6
phencyclidine (PCP)	5
Hydromorphone	5
Citalopram	4
Temazepam	3
Oxazepam	2
Trazodone	2
Oxymorphone	2
Butalbital	2
Dihydrocodeine	2
Pseudoephedrine	2
6-Acetylmorphine	2
Fentanyl	2
3,4-methylenedioxymethamohetamine (MDMA)	2
Fluoxetine/norfluoxetine	1
Venlafaxine/norvenlafaxine	1
Gabapentin	1
Cyclobenzaprine	1
Amitriptyline	1
Topiramate	1

number of 12,048 positive results in the 12 months prior to October 2012. This underscores the conclusions from other works cited identifying marijuana use as the most prevalent drug present in drivers (2), in both fatally injured (3) and impaired driver (4, 5) populations. The frequency of detecting evidence of marijuana use was four times greater than of the second most prevalent drug, alprazolam/alpha-hydroxyalprazolam. Alprazolam/alpha-hydroxyalprazolam, diazepam/nordiazepam and cocaine/metabolites were all reported in the top 20 for 100% ($n = 13$) of the oversampled laboratories, with the total number of positives ranging from 1,824 (cocaine and/or metabolites) to 2,942 (alprazolam/alpha-hydroxyalprazolam). Methamphetamine was reported in the top twenty most frequently encountered drugs for nine of the thirteen surveyed laboratories. The fact that not all laboratories had it in their top twenty reflects the fact there are significant regional variations in the prevalence of methamphetamine (19). Other high-incidence positives were for oxycodone (1,715), carisoprodol/meprobamate (1,666), hydrocodone (1,435), clonazepam (1,418) and zolpidem (884).

Recommendations

Matrix

Blood and oral fluid are the preferred matrices for DUID investigations. Blood is preferred because drug and metabolite concentrations can be evaluated within the context of therapeutic, toxic or recreational use. Although in any given case, issues related to tolerance and individual sensitivity must be considered, reference concentrations in blood provide useful interpretive context. Oral fluid is emerging as an alternative to blood for reasons related to ease and cost of collection, ability to obtain a sample proximate to the time of driving and the prospect of having preliminary on-site test results available to law enforcement for probable cause or evaluation purposes. Oral fluid drug concentrations, however, cannot be reliably translated into blood concentrations and oral fluid drug testing seems best suited to *per se* states, or circumstances where the subject's impairment has been documented through observation, sobriety tests and physiological indicators, as is done in the Drug Evaluation and Classification Program (DECP). In these cases, a qualitative oral fluid result can be used to identify recent drug usage. Detection windows for drugs in oral fluid roughly mirror those in blood (20).

Urine is a specimen best suited to demonstrate prior drug use or exposure (e.g., preemployment or workplace testing) rather than impairment proximate to the time of driving. In a DUID context, a positive urine drug test result could reflect use some time distant from the actual driving and beyond the duration of effect, or impairment. Urine drug concentrations are as much a function of the volume of liquid consumed as the amount of drug consumed. Urine can arguably be useful in a *per se* setting, but the nexus with behavioral impairment is weaker due to the long window of detection. In the absence of the *per se* or zero-tolerance statutory approach, jurisdictions that permit the use of urine must rely heavily on other observations and indicators as described earlier. Many states permit the use of urine as a valid specimen for DUID investigations, so recommendations are made here for its analysis.

Scope

Alcohol testing must be performed in conjunction with the recommended scope for drug testing. Although data from the 2007 National Roadside Survey indicated greater rates of drug use in drivers than alcohol use, alcohol is still recognized by the participating laboratories as the most prevalent drug in impaired driving crashes and fatalities. If a forensically defensible breath alcohol test is not performed in the field, a blood alcohol test must be performed in the laboratory. The current widespread practice of omitting drug testing if the blood alcohol concentration exceeds 0.08 g/100 mL in blood, or g/210 L in breath, is counterproductive and creates a blind spot in our knowledge about co-morbid drug and alcohol use. Other indicators discussed above suggest combined drug and alcohol use is prevalent making adherence to consistent analytical testing and reporting critical.

The analytical approach recommended as a result of this review focuses on testing two tiers of compounds. The recommended scope for Tier 1 and Tier 2 drug testing is based on consideration of the laboratory prevalence data from the consensus meeting participants (Table I) and other published reports of drugs in arrested (17), hospitalized (11) and fatally injured drivers (10). Tier 1 is comprised of those drugs that are most prevalent in US driving populations, and for which there is the strongest evidence of impairment. Importantly, the Tier 1 drugs can all be detected by the use of commercially available immunoassays, utilized in most laboratories. This approach represents

a cost-effective way for laboratories to come into compliance with the recommendations, although the scope of the Tier 1 drugs is reduced from the 2007 recommendations. Broader-based chromatographic screening techniques, such as gas chromatography–mass spectrometry (GC–MS), liquid chromatography–tandem mass spectrometry (LC–MS-MS) or liquid chromatography accurate mass instruments, can also be used to analyze for all Tier 1 drugs. Table II lists the recommended scope and cutoff concentrations for Tier 1 compounds in blood and urine, and Table III for the Tier 1 compounds in oral fluid. The recommended immunoassay panel to address this scope is summarized in Table IV. In addition to general drug-class assays, separate immunoassays may be necessary for specific compounds due to their low cross-reactivity with some immunoassay kits (i.e., lorazepam and clonazepam, oxycodone and oxymorphone, 3,4-methylenedioxymethamohetamine and 3,4-methylenedioxyamphetamine). Tier 2 compounds (Table V) are drugs that are less frequently encountered, of regional rather than national significance and/or beyond the routine analytical capabilities of some laboratories. Nonetheless, they are drugs that are associated with the potential for impairment. Tier 2 compounds should be considered by laboratories for inclusion either in a more comprehensive analytical approach or to escalate the analysis in cases where Tier 1 compounds are absent, despite documented impairment. Compounds in Tier 2 include inhalants (e.g., toluene and 1,1-difluoroethane), some hallucinogens, notably lysergic acid diethylamide (LSD), dissociative anesthetics (e.g., ketamine and dextromethorphan) and additional CNS depressant drugs. Although important categories in the DRE program, these drugs are believed to be less prevalent than Tier 1 drugs, and may require additional analytical procedures, as well as instrumentation and resources that are not available in all laboratories. Consequently, their inclusion in Tier 1 could not be justified at this time.

Regional differences in drug-use patterns may prompt the inclusion of additional drug classes from Tier 2 in a laboratory's primary scope, but in order to accomplish one of the goals of

Table II
Recommended scope and cutoffs in ng/mL for screen and confirmation in blood and urine

Drug	Blood		Urine	
	Screen	Confirm	Screen	Confirm
DRE category; cannabis				
THC	–	1	–	2
Carboxy-THC	10	5	20	5
11-OH-THC	–	1	–	2
DRE category; CNS stimulants				
Methamphetamine	20	20	200	50
Amphetamine	20	20	200	50
MDMA	–	20	200	50
3,4-methylenedioxyamphetamine (MDA)	–	20	200	50
Cocaine	–	10	–	20
Benzoylecgonine	50	50	150	50
Cocaethylene	–	10	–	20
DRE category; CNS depressants				
Alprazolam	–	10	–	50
Alpha-Hydroxyalprazolam	–	–	–	50
Clonazepam	10	10	–	50
7-Aminoclonazepam	10	10	–	50
Diazepam	–	20	–	50
Nordiazepam	50	20	100	50
Lorazepam	10	10	–	50
Oxazepam	50	20	100	50
Temazepam	–	20	–	50
Carisoprodol	500	500	500	500
Meprobamate	500	500	500	500
Zolpidem	10	10	–	20
Butalbital	300	500	300	500
Phenobarbital	300	500	300	500
DRE category; narcotic analgesics				
Codeine	–	10	–	50
6-Acetylmorphine	–	5	–	10
Hydrocodone	–	10	–	50
Hydromorphone	–	5	–	50
Methadone	50	20	300	50
Morphine	10	10	200	50
Oxycodone	10	10	100	50
Oxymorphone	10	5	100	50
DRE category; dissociative drugs				
Phencyclidine	10	10	25	10

Table III
Recommended scope and cutoffs in ng/mL for screen and confirmation in oral fluid

Drug	Screen	Confirm
DRE category; cannabis		
THC	4	2
Carboxy-THC	x	0.02
11-OH-THC	x	x
DRE category; CNS stimulants		
Methamphetamine	20	20
Amphetamine	20	20
MDMA	20	20
MDA	20	20
Cocaine	20	8
Benzoylecgonine	20	8
Cocaethylene	x	8
DRE category; CNS depressants		
Alprazolam	x	1
Clonazepam	x	1
7-Aminoclonazepam	x	1
Diazepam	x	1
Nordiazepam	x	1
Lorazepam	x	1
Oxazepam	5	1
Temazepam	x	1
Carisoprodol	100	100
Meprobamate	100	100
Zolpidem	10	10
Butalbital	50	50
Phenobarbital	50	50
DRE category; narcotic analgesics		
Codeine	x	10
6-Acetylmorphine	x	5
Hydrocodone	x	10
Hydromorphone	x	10
Methadone	50	20
Morphine	20	10
Oxycodone	20	10
Oxymorphone	20	10
DRE category; dissociative drugs		
Phencyclidine	10	10

Table IV
Recommended immunoassay scope

Cannabis
Methamphetamine
Amphetamine
Cocaine/metabolite
Benzodiazepines
Lorazepam
Clonazepam
Carisoprodol
Zolpidem
Barbiturates
Methadone
Opiates
Oxycodone
PCP

Table V
Recommended compounds for Tier 2

DRE category; cannabis	DRE category; CNS depressants ctnd.
Synthetic cannabinoids	Phenazapam
DRE category; CNS stimulants	Phenytoin
Cathinones	Pregabalin
Modafinil	Quetiapine
Methylphenidate	Risperidol
DRE category; CNS depressants	Secobarbital
Amitriptyline	Sertraline
Buprenorphine	Topiramate
Carbamazepine	Trazodone
Chlordiazepoxide	Tramadol
Chlorpheniramine	Triazolam
Citalopram	Valproic acid
Clonidine	Venlafaxine
Cyclobenzaprine	Zaleplon
Desipramine	Zopiclone
Diphenhydramine	DRE category; narcotic analgesics
Doxepin	Fentanyl
Doxylamine	Meperidine
Fluoxetine	Tapentadol
Gabapentin	Propoxyphene
Gamma-hydroxybutyrate	DRE category; dissociative drugs
Hydroxyzine	Ketamine
Imipramine	Dextromethorphan
Lamotrigine	DRE category; inhalants
Mirtazepine	Inhalant class
Nortriptyline	DRE category; hallucinogens
Olanzapine	LSD
Paroxetine	Psilocybin

generating a robust epidemiological data set, Tier 1 must be considered the minimum acceptable scope. For the same reasons, comprehensive Tier 1 analysis should always be completed, even if the DRE officer's opinion is that only one drug category was present.

Laboratories must offer confirmatory testing for all compounds included in their drug screening scope, and should only report test results after those confirmatory analyses have been performed. Reporting a presumptive screening-positive test result is a dubious practice when charging and plea bargain decisions are being made based on the results, even if the confirmation would be performed before going to trial. The National Safety Council's CAOD has issued a position statement advising against reporting unconfirmed results (21).

The laboratory's scope of testing should be clearly communicated to the agency or individual ordering the testing. Ideally, this information would appear on the report. Inclusion of this kind of information is one of the recommendations in the 2009 National Academy of Sciences Report on Strengthening Forensic Science in the USA (22). If a laboratory is not able to offer analytical support for a particular drug or drug category, it is the responsibility of the laboratory as the subject matter expert, rather than the customer, to identify another laboratory that can provide the appropriate analytical support.

Cutoff concentrations

Screening cutoff concentrations were selected based on the consideration of concentrations associated with therapeutic use and abuse and concentrations found in impaired driving populations. The concentrations should not be inferred to be thresholds for impairment, as those are difficult to assess for many drugs although attempts have been made (23). Even therapeutic amounts of a drug may be relevant with respect to impaired driving due to lack of tolerance, withdrawal and drug–drug or drug–alcohol interactions. These recommended screening cutoff concentrations are readily attainable using commercially available immunoassay kits, making adoption of these updated recommendations straightforward. The screen cutoff concentrations were selected to be equal to or greater than those used for confirmation purposes, with the exceptions of butalbital and phenobarbital, and within the capabilities of the routinely available laboratory confirmation techniques of GC–MS and LC–MS-MS. The panel stressed that different immunoassays have different cross-reactivity with drugs within a class, and this must be evaluated when selecting an immunoassay for the Tier 1 scope. The panel noted that the Tier 1 scope could be accomplished with a suite of 11–14 immunoassays depending on the cross-reactivity of the selected kits, as previously discussed. Methods must be validated according to currently acceptable standards and they should include, at a minimum, precision, drift and validation of cutoff concentrations for immunoassays: limits of detection and quantitation and linear range for confirmatory quantitative methods. The Scientific Working Group on Forensic Toxicology (SWGTOX) has issued draft guidelines for method validation (24), and appropriate method validation is discussed in other publications (25).

Discussion

Implementation

In support of the updated survey and recommendation revisions, ~30% of the survey respondents whose laboratories were not compliant with the 2007 recommendations for blood sample testing indicated that they disagreed with some aspect of the recommendation. Approximately 18% of the survey respondents indicated the same with respect to urine samples. Deficiencies in staffing, appropriate instrument technology, instrument capacity and/or method validation were the other main reasons identified for not meeting the 2007 recommendations for both sample types. Several survey participants responded that they routinely perform qualitative analysis only or that quantitative analysis is only performed in select cases for blood samples. With respect to both sample types, some respondents indicated that DUID law in their jurisdiction covers only scheduled substances, making it hard to justify expenditure of resources on more extensive testing. Some laboratories performing qualitative testing did not have data to state with confidence what their analytical cutoff concentrations were for many drugs, making it hard to tell whether they met the recommendations or not. Several laboratories noted that under some circumstances they would report presumptive positive results to agencies, without confirmation. As already addressed, this practice is highly discouraged.

After considering the reasons why the 2007 recommendations were not more broadly adopted, the following strategies were identified to accelerate adoption of this revised document. A larger number of laboratories (96) were surveyed to ensure that the revised recommended scope was within available technology capabilities. A larger survey population minimizes the risk of technological or capital cost barriers preventing the adoption of the recommendations, while ensuring that scope and targeted cutoff concentrations remained relevant to known

prevalence and concentrations of drug use in the impaired driving population. The creation of a two-tier testing approach allows uniform data to be collected and reported on the Tier 1 compounds, whose contributions with respect to impaired driving are well established. The panel recommends further research on the prevalence of the Tier 2 category compounds by way of routine testing by a limited cross-section of laboratories to ensure that data regarding emerging drugs (e.g., synthetic cannabinoids and cathinones, i.e., 'bath salts') and those about which little is currently known (e.g., buprenorphine) are collected for consideration for future inclusion in Tier 1.

Forensic toxicology stakeholders must promote the adoption of these recommendations within relevant professional organizations through mechanisms including resolutions, endorsement and available training and education. This is being done with the distribution of this report back to the laboratories that were initially surveyed and through the National Safety Council, the AAFS and SOFT. Government grants for the equipment, technology and training needs of laboratories can also be used to leverage compliance. It is crucial that there is widespread distribution of these recommendations not only to forensic toxicology laboratories, but also to allied stakeholder groups who can influence the policies, resources and funding of laboratories. The recommendations must be promoted with professional stakeholder groups in the law enforcement, criminal justice, traffic safety, accrediting organizations and broader forensic science arenas. Training programs outlining the recommendations and practical approaches to their implementation should be prepared for presentation at national professional meetings of key stakeholder groups. The success of these revised recommendations can be judged based on several metrics, including re-survey of laboratories in 2018, monitoring the quality of data being provided to FARS, and case studies from a cadre of high-conformance laboratories to demonstrate the utility of this approach.

Conclusions

As noted in the 2007 recommendations, a traffic stop for impaired driving, whether caused by alcohol or other drugs, removes that driver from the road and prevents the risk of injury or death to that driver and other road users. Additionally, it initiates a process that, when it works, can change the behavior of that individual and reduce the risk of future re-offense. Accurate, comprehensive toxicology testing is key to that process. More uniform analytical approaches will allow the collection of more robust data concerning the prevalence of drug use among impaired and fatally injured driver populations, providing important contributions to both public safety and public health.

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