North American Roadside Surveys: Use of Oral Fluid, Results and Future Direction

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Introduction

Many countries have carried out research projects and have on-going programs studying the utility of oral fluid as a viable specimen for collection from drivers at the roadside, as a means to determine drug and alcohol ingestion. In Europe, the Roadside Testing Assessment projects, ROSITA 1 (1999 -2000) and ROSITA 2 (2003 – 2005) were followed by Driving under the Influence of Drugs, Alcohol and Medicines (DRUID 2010 - 2011), all of which were concerned with various aspects of traffic safety including the presence of drugs and alcohol in drivers, using blood and oral fluid. In North America, the 2005 pilot project for National Roadside Survey (NRS) was the first to include the collection of biological specimen other than breath, and made provision for the collection of both oral fluid and blood from drivers. As a result of the excellent agreement regarding the presence of drugs between specimen types, the 2007 NRS included the collection of both matrices. In 2010 a project in California incorporated oral fluid collection from drivers, and in 2011 the Crash Risk Study in Virginia Beach included both blood and oral fluid collections. Canada included oral fluid testing of drivers in their 2010 British Columbia Survey and it is likely that the 2013 NRS will include both oral fluid and blood pairs.

In October 2011 the White House and Mothers Against Drunk Driving (MADD) joined forces to create a new campaign against drugged driving. The Office of National Drug Control Policy (ONDCP) reports that in the last 5 years while the overall numbers of drivers fatally injured in accidents has declined, the number of drug involved deaths has increased. There is an increasing awareness that drugs, in particular marijuana, may be a factor in traffic accidents. Since laboratory procedures for the detection of drugs and alcohol in blood and oral fluid have improved greatly over the last 10 years, the ability to use formerly difficult matrices to identify drug ingestion has become routine. The mechanism to educate individuals to the potential traffic safety dangers of using medical marijuana, or legally obtained prescription drugs before driving is an important aspect of the research.

Effect of drugs on driving

While an argument can be made that any form of distraction in a driver increases the chance of a traffic accident (e.g. cell phone use, texting, drowsiness etc.) many research projects have been devoted to the effects of specific drug classes on motor skills.

Cannabis: While several epidemiological studies have been inconclusive as to cannabis use causing an increased risk of accidents, a recent review of the literature concluded that "*Acute cannabis consumption is associated with an increased risk of a motor vehicle crash, especially for fatal collisions. This information could be used as the basis for campaigns against drug impaired driving, developing regional or national policies to control acute drug use while driving, and raising public awarenes*s" [1]. The use of marijuana shortly before driving increases the chance of an accident attributable to the driver. Further, as expected there is evidence that cannabis use leads to dose related impairment in simulated driving and psychomotor skills. Essentially all research studies in this area agree that when combined with alcohol, the odds ratio of being involved in or causing a traffic accident is significantly increased over the use of marijuana alone [2,3].

Opioids: The side-effects of opioid use include slowed vital signs and drowsiness. However, literature on the topic of driving and opioid use have largely concluded that patients on chronic opioid analgesic therapy (COAT), i.e. those who take their medications correctly, do not have a greater risk of causing traffic accidents than other drivers [4,5].

Naïve subjects do however have a higher risk of being at fault in a traffic accident particularly in the early stages of treatment, and before a routine regimen is established [6].

Benzodiazepines: Benzodiazepines are prescribed for the treatment of anxiety as well as for sedative purposes. In 1998, Barbone et al. recommended that patients taking benzodiazepines and/or zopiclone do not drive due to the significantly increased chance of traffic accidents [7]. In general, the literature since that publication has supported the view that drivers taking the longer acting older benzodiazepines (e.g. diazepam) are at higher risk of accident involvement than those taking newer shorter acting drugs (e.g. alprazolam) [8]. Two recent reviews show that while the evidence is improving that the use of benzodiazepines increases the likelihood of driving accidents, more research is needed for both benzodiazepines and opioids in order to assist doctors in the prescribing of these medications [9, 10].

Previous Surveys

National Roadside Survey 2007 (NHTSA): The final NRS report was published in January 2010 (www.nhtsa.gov). A published survey of toxicological laboratories showed that the most prevalent drug detected in blood from driving cases was marijuana, followed by benzodiazepines, cocaine, hydrocodone, morphine/codeine, methamphetamine, carisoprodol, oxycodone, methadone, tricyclic antidepressants and zolpidem [11]. Following this information, it was essential that these drugs and metabolites were included in the test profile for both matrices, over 75 drugs and metabolites. Since oral fluid drug concentrations have shown some variation depending on the collection device, the Quantisal™ was used for the North American studies discussed here.

Results: Overall, 16.3% of drivers were positive for one or more drugs, with almost half having marijuana present in the sample. From 326 pairs of samples which were positive in both matrices, 247 (75.7%) were an exact drug match across all classes; a further 70 (21.4%) had at least one drug match between matrices, giving a combined 97.1% correlation for positivity between sample matrices. Cocaine was detected more often in oral fluid than in blood; marijuana was detected more often in blood than oral fluid. However, the blood test profile included metabolites of marijuana whereas the oral fluid assay did not. Therefore, it is likely that several drivers were found positive for marijuana metabolites via blood only and not the active drug, tetrahydrocannabinol (THC).

California Initiative (NIDA/NIAAA) 2010: The objective of the 2010 California Initiative was to determine the prevalence of cannabis in drivers. Oral fluid specimens were collected from approximately 900 drivers, at night time during the weekend. Most drivers were male (63.2%), White (60.5%) and had a median age of 29y.

Results: Overall 14.4% of drivers tested positively for one or more drugs, with 7.8% positive for marijuana, an increase from 4.9% of California drivers in the NRS 2007 study. In addition, drivers were asked if they had a prescription for medical marijuana. While only 36 drivers admitted to having a prescription, 38.9% were positive for THC. When controlled for race, age and jurisdiction, those drivers were significantly more likely to test positively than drivers without a prescription.

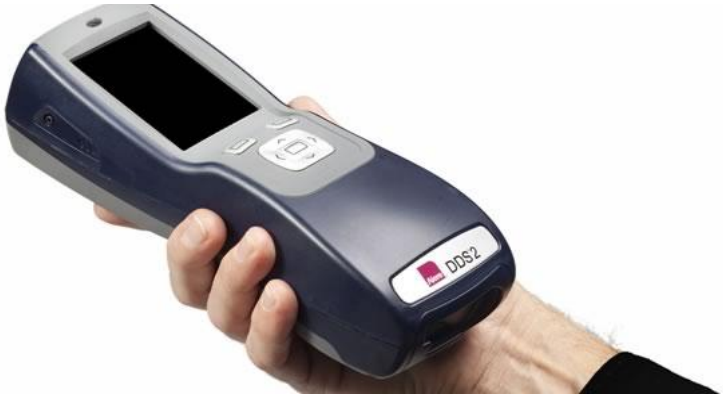
On-going Studies

Crash-Risk Study (NHTSA): In 2010-2011, the Crash Risk Study was carried out in Virginia Beach, VA. The purpose of the study was to attempt to obtain specimens from a control group of drivers traveling in the same direction of traffic on the same stretch of road, at the same time and in similar vehicle types to those where significant traffic accidents had occurred the previous week. The study was intended to address some of the difficulties involved in interpreting drug concentrations with no controlled dose information or knowledge of time of intake such as in accident involved drivers. At the time of writing the study analysis has been completed and reports are being prepared.

California Initiative (NIDA/NIAAA): In the summer of 2012 the California Initiative was repeated at 9 locations within the State. At the time of writing the study analysis has been completed and reports are being prepared. Within the original survey, drivers were asked to provide an oral fluid sample using the Quantisal™, a collection device designed to obtain 1mL (+-10%) of neat oral fluid, which is then capped and sent to a laboratory facility for testing. This was the standard procedure throughout the National Roadside Surveys, Crash Risk Study and the California Initiatives.

At one of the 2012 sites (Gardena) a subset of drivers were asked to participate in an additional test (IRB approved). There were no refusals among the drivers who were asked. After the main Quantisal™ collection, drivers were asked to give another oral fluid specimen using the collector associated with the rapid test instrument. The device is a very rapid collector for saliva, with the indication the sample is adequate taking an average of one minute; the drivers were then allowed to leave the survey site.

The samples were tested at the site using the Drug Detection Mobile Test System (DDS2®) for cocaine, amphetamine/methamphetamine, opiates and marijuana by inserting the pad into the test cartridge inside the DDS2 unit.



Fifty drivers were asked to participate and thirty-eight valid results were obtained. Of these, 6 screened positively; 5 for THC and one for methamphetamine. The confirmation laboratory was blinded to the screening data until after the Quantisal™ results had been provided to the Study Director.

When compared to the Quantisal™ laboratory results, the results matched in all cases (100%). All the negative DDS2® results were negative in the laboratory testing; all the positive DDS2® results were positive for the corresponding drugs. While the results matched perfectly, there were only 38 valid runs of the DDS2® system. The test errors may have been due to inadequate flow from the pad to the detection unit – possibly because drivers had already given one oral fluid sample, although this is somewhat speculative.
Overall the results of the on-site rapid test, while preliminary, were very encouraging. Based on this data, the availability of a reliable handheld oral fluid test unit for use by police officers at the roadside is likely in the very near future.

Summary

The viability of oral fluid for roadside drug testing is past the stage of collection device performance and discussion regarding insufficient, inconsistent, or inadequate volume for laboratory-based analysis. Many countries have already accepted oral fluid as a reliable specimen source for drug tests. While roadside collection for laboratory analysis is currently more reliable and tests for a wider range of drugs than the on-site test devices, roadside instruments such as the DDS2® and the Draeger DrugTest 5000 are showing significant promise. While advancements are always necessary, interest in using oral fluid for roadside collection and analysis is escalating rapidly, and technology is catching up.

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