WPMO 2005, 7th International Conference on Clinical Forensic Medicine of the World Police Medical Officers

May 13, 2005

ROADSIDE DETECTION OF DRUG-IMPAIRED DRIVING

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Introduction

All Australian indicators suggest that the scale of the problem of drug-impaired driving is roughly one fourth of the scale of the drink-driving problem. Similar proportions are found amongst living casualties of at-fault road crashes and in fatalities.

An analysis was conducted of 620 specimens obtained from drivers who had either crashed or who showed overt signs of intoxication at the roadside. Of these, 377 were positive for alcohol at levels above 0.05% and 101 were positive for drugs capable of causing impairment suggesting a relative prevalence of 26.8%. This may be an under-estimate because most of the specimens that were positive for alcohol, including all those where the BAC exceeded 0.15%, were not analysed for drugs. The results from the specimens analysed for drugs are shown in figure 1.

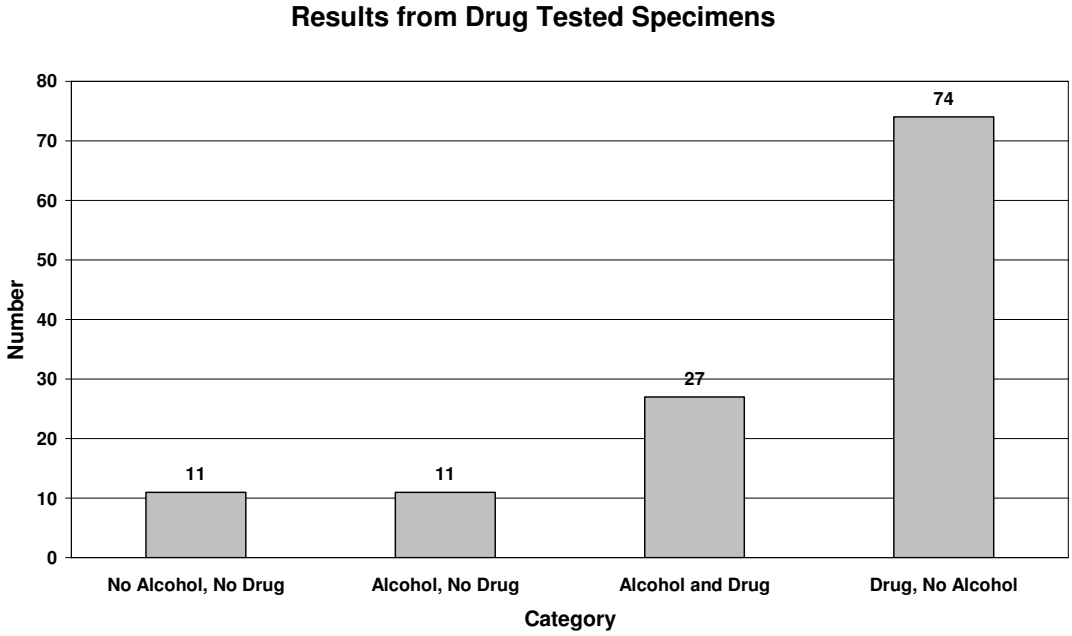

Figure 1.

The true relative proportion amongst drivers who do not crash is not known. This is because we have a means of detecting drink-driving offences through random breath testing of drivers but lack an appropriate means of detection of drugged drivers.

Contrasting with the scale of the problem there is

- A public perception that drug-impaired driving does not create an offence; and
- Proportionately low arrest and prosecution rates for drug-driving consequent on the lack of suitable detection technology analogous to roadside breath testing.

Defining the Problem

A review of drug-impaired driving offenders in Queensland shows that there are four drug classes (and only four) of interest. These are phenethylamine-based stimulants (predominantly methylamphetamine), opioids, benzodiazepines and cannabis. Cocaine use is not prevalent amongst drivers or generally[1]. We do not know whether or not solvent abuse is a problem as specimens are not routinely subjected to head-space analysis. The relative prevalence of drug classes detected is shown in figure 2.

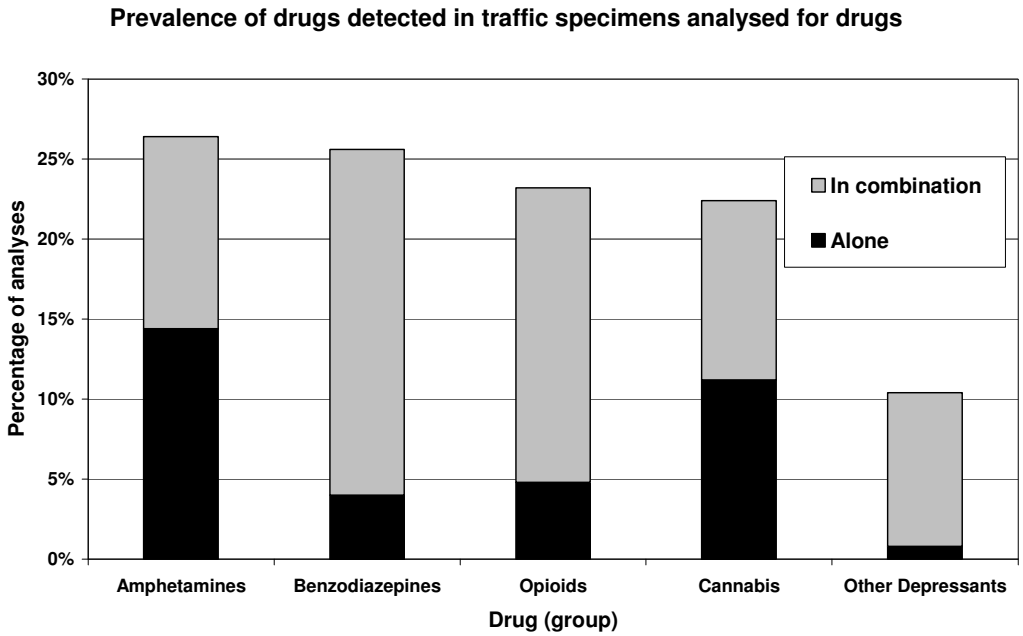

Figure 2.

Although other depressants were detected in 10.4% of specimens these were usually in combination with other drugs. This may be important because a screening test capable of detecting only the other four classes would permit these drugs to be detected during confirmatory testing using, for example, GC-MS or LC-MS.

Currently, in order for police to prosecute they must have sufficient suspicion of intoxication to arrest and then corroborate the signs observed by collection and analysis of a blood specimen. As is the case in other jurisdictions, police are naturally and appropriately wary about the consequences of arresting motorists without sufficient foundation. As a result they are unlikely to make an arrest unless the indicia of intoxication are overt.

The opportunity to be successful through observation alone is limited further by the fact that most drivers will be observed only whilst seated in their vehicle. In Queensland, police do not have powers to require drivers to exit the vehicle for assessment. Even when they do have cause to ask them to leave the vehicle they have no training and no lawful authority to require drivers to undertake sobriety tests.

[1] Cocaine use has not reached similar proportions to what is seen in North America and Europe. At the moment methylamphetamine is readily and cheaply available from local manufacture from pseudoephedrine in contrast with cocaine which must be imported and is expensive.

In Victoria there is a cadre of specially trained officers who do undertake standardised field sobriety tests. However, they are limited in number and the circumstances in which the testing is conducted are cumbersome.

Over the last thirty years we have seen an overall reduction in the prevalence of drink-driving. This has resulted from

- A very successful public education campaign that has reduced the social acceptability of drink-driving; and
- The widespread use of random breath testing that has created the expectation amongst motorists that they are likely to be caught if they drink and drive.

During the same period there has been a general increase in drug use within the community accompanied by:

- No education campaign targeted specifically towards the hazards and wisdom of drug-driving; and
- The absence of capacity to detect or deter.

The Options

I (and others) have conducted a number of experiments comparing roadside detection options, including:

- Measurement of signs using DRE-type protocols;
- Saliva testing;
- Urine testing;
- Observation of general signs of intoxication; and
- Pupillometry.

The criteria for selection of a roadside screening test for drug-impaired driving are:

- High sensitivity and specificity;
- Strong positive and negative predictive values;
- Capacity to detect impairment rather than simply presence;
- Simple and practical to use;
- Low unit cost; and
- Capacity to detect impairment that falls short of frank intoxication.

In a perfect world the option selected should be as reliable and simple to use as the hand-held devices for breath alcohol whilst having an acceptable unit cost with no marginal cost per test.

So far as their capacity to detect is concerned, the options can be divided broadly into observational systems and technology options. A summary of the effectiveness of the approaches is presented in Table 1.

	Option	
	Observational	Technology
Sensitivity[2]	≤ 4%	>90%
Specificity	~98%	~99%
Positive Predictive Value	80-90%	~100%
Negative Predictive Value	98%	~100%

Table 1.

It is obvious from the disparity in the above table that whilst observational methods meet the price test they have limited value in law enforcement.

Urine drug testing is well established and its value and limitations are well known. The sensitivity is high but it suffers from poor specificity if the goal is to detect impairment rather than presence. However, the main problem with urine testing as a screening test for drug-driving is its practicability, effectively precluding its use outside a totalitarian régime.

Saliva testing and pupillometry appear to be the two front-runners for effective roadside screening.

Saliva-testing uses rapid immunoassay techniques to determine the presence of drugs in saliva. In a subject with adequate saliva, tests take a minimum of ten minutes to administer and positive results require some form of confirmation, probably with either further saliva or blood specimens for GC-MS or LC-MS.

There are five potential disadvantages with saliva tests[3]. These are:

1. Cost. Individual tests cost about AU$25[4]. Even in high yield random screening locations where the prevalence of drug-driving is high at about 3% this makes the cost per detection around AU$833 and even higher in general use.
2. Test cut-offs. The emergent nature of this technology means that the cut-offs for detection require the presence of much higher levels of drug than would be the case for urine immunoassay. This can mean that drivers who are impaired but below the technical capacity to detect may evade detection.
3. Discrimination between presence and impairment. Currently the cut-offs are so high that it would be improbable that an unimpaired person would provide a positive result. As the technology improves these test will be likely to have the capacity to detect much lower levels.
4. Discrimination between illicit and licit use. It is well recognised that, for example, opioid drugs may be consumed for therapeutic purposes but, on arriving at steady state dosing, are unlikely to impair driving performance. Similar drug levels from erratic non-therapeutic use are more likely to cause impairment. A test that detects only levels will not distinguish between the two.

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[2] **Sensitivity** – how good the test is at detecting true positives.
Specificity – how good the test is at detecting true negatives.
Positive Predictive Value – The proportion of test positives that are genuine positives.
Negative Predictive Value - The proportion of test negatives that are genuine negatives

[3] I do not consider that the lack of national or international standards is a prohibitive disadvantage.

[4] About US$19, €15.

5. Classes of drugs. Saliva tests are currently limited in their capacity to detect some drug (classes) with benzodiazepines being notable in this regard.

Some, but not all, of these disadvantages can be reduced by selecting technology based on a roadside analyser (as opposed to single-use disposable units).

The pupillometer that I have appraised is the EyeCheck™ manufactured by MCJ Inc., Rockford, Illinois[5]. This has the external appearance of a pair of space-age binoculars – Figure 3.

Figure 3. EyeCheck™ Device.

The device works by having the subject focus on a target following a thirty second period of dark acclimatisation. Following this measured light pulses cause temporary pupillary constriction. The pre- and during- test responses are measured by collating the quantity of light reflected by the retina. Unlike some other tests using pupillometry, individual baseline data are not required.

Assessment was conducted on a population comprising:

- 93 "normals";
- 65 "drug affected" police detainees; and
- 4 patients stabilised on methadone

Results showed sensitivity and specificity of 100% and 97.8% respectively with a PPV and NPV of 97.0% and 100% respectively. None of the patients stabilised on methadone returned a positive result.

EyeCheck™ also has its disadvantages:

1. The cost of the unit is close to US$10,000. However, the cost per test is zero, making this a more cost-effective option than saliva-testing after 400 tests have been done.
2. Access to a (laptop) computer is required to analyse and interpret the results.

However, it does:

- Discriminate between impairment and presence – overcoming the difficulty of distinguishing between unimpaired licit use and other use; and

[5] www.mcjeyecheck.com

- Provide coverage for all drug classes including solvents.

There are some known confounders which can be largely predicted from the mechanism of operation. These include some neurological diseases, eye pathology and some non-impairing drugs. All of these are relatively rare.

Conclusion

Of the detection options assessed, only pupillometry meets the criteria necessary for selection of a screening test. It is not now and never will be sufficiently discriminatory to be used as a confirmatory test. However, as a screening test used as a basis for further (confirmatory body fluid) testing its' potential is unrivalled.

Declaration of Interests

Materials for these studies, including saliva and urine screening kits and the loan of an EyeCheck™ device were provided free of charge by the respective manufacturers. No other financial assistance was sought or provided.

This paper was presented at the World Police Medical Officers' Seventh International Conference on Clinical Forensic Medicine at Dunblane in Scotland on 13th May 2005.