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THE PERFORMANCE OF THE APPROVED SCREENING DEVICE, THE ALCOTEST® 7410 GLC IN THE FIELD: LOW INCIDENCE OF FALSE POSITIVE RESULTS IN THE IDENTIFICATION OF DRINKING DRIVERS

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ABSTRACT

A retrospective field study was conducted of 811 drinking drivers in the city of Toronto between January 1st 1998 and December 31st 1999 who had a breath alcohol concentration (BrAC) >0.099 g/210 L as determined by the Alcotest® 7410 GLC, the approved screening device (ASD). To determine the false positive rate of the ASD, its results were compared to the BrACs subsequently determined by the Intoxilyzer® 5000C, the evidential approved instrument. The BrACs determined by the Intoxilyzer® 5000C ranged between 0.000 and 0.310 g/210 L (mean 0.134 g/210 L). Seventeen drivers (2.1%) had a BrAC < 0.08 g/210 L and 117 drivers (14.4%) had a BrAC< 0.100 g/210 L at the time of the Intoxilyzer® 5000C test. When the BrACs are corrected for the time delay (0.1 to 2.6 hours) between the ASD and Intoxilyzer® 5000C tests, only two drivers (0.2%) had an estimated BrAC < 0.080 g/210 L and twelve drivers (1.5%) had a BrAC < 0.100 g/210 L. Thus, the Alcotest® 7410 GLC operated under field conditions has a low incidence of false positive tests.

RÉSUMÉ

Une étude rétrospective a été effectuée entre le 1er janvier 1998 et le 31 décembre 1999 sur 811 conducteurs arrêtés pour capacité de conduite affaiblie dont la teneur en alcool dans l'haleine dépassait 0,099 g/210L, selon les résultats obtenus par l'appareil de détection approuvé (ADA) Alcotest® 7410 GLC. Ces résultats ont été comparés avec ceux obtenus subséquemment à l'aide d'un alcootest approuvé, l'Intoxilyzer® 5000C afin de déterminer le nombre de faux résultats positifs. Les teneurs en alcool dans l'haleine déterminées par l'Intoxilyzer® 5000C se situaient entre 0,000 et 0,310 g/210 L (moyenne : 0,134 g/210L). Les analyses effectuées sur l'haleine avec l'Intoxilyzer® 5000C ont démontré que dix-sept conducteurs (2,1%) avaient une teneur en alcool inférieure à 0,08g/210L alors que 117 (14,4%) avaient une teneur en alcool inférieure à 0,100 g/210L. Lorsque les résultats sont ajustés pour tenir compte du délai (0,1 à 2,6 heures) entre l'ADA et l'alcootest, seulement deux conducteurs (0,2%) ont une teneur en alcool dans l'haleine estimée inférieure à 0,080g/210L et douze conducteurs (1,5%) avaient une teneur en alcool dans l'haleine estimée inférieure à 0,100g/210L. Donc, l'utilisation de l'Alcotest® 7410 GLC sur le terrain démontre une faible fréquence de faux résultats positifs.

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INTRODUCTION

In Canada the *per se* statutory blood alcohol concentration (BAC) is currently 80 milligrams of alcohol in 100 millilitres of blood. To more effectively enforce this *per se* BAC, the Criminal Code of Canada allows a police officer to demand that a breath sample be provided into an approved screening device (ASD) from a person who is operating, or has care or control, of a motor vehicle if the officer reasonably suspects that the driver has alcohol in his/her body. If an F (FAIL) is obtained by the ASD, the police officer then has reasonable and probable grounds (RPG) to believe that the driver has a BAC greater than 80 milligrams of alcohol in 100 millilitres of blood. The driver is then arrested and is required to provide additional breath samples into the evidential approved instrument, which is usually conducted at the police station. It is the result of the evidential approved instrument that is used in criminal proceedings; the ASD is considered to be an investigative tool only. However, if other evidence (e.g. obvious physical signs of intoxication or poor driving behaviour) gives the police officer reasonable and probable grounds that the driver was impaired by alcohol or a drug, the screening test using the ASD is not required, and only the evidential approved instrument is used for testing. A summary of this process is shown in Figure 1.

The ASD allows police officers to determine if a driver has a BAC greater than 80 milligrams of alcohol in 100 millilitres of blood when physical observations or other evidence are insufficient. For instance, drivers with a high tolerance to alcohol may exhibit few visible signs of intoxication even when their BAC is well in excess of 80 mg/100mL (1–4). Recently, it has been argued in Ontario's Criminal Courts that the ASD as operated by the police in the field is unreliable and therefore a police officer could not form reasonable and probable grounds to arrest the driver based on the results of the ASD. As a result, the police officer's grounds to demand an evidential breath test would be void and the results of the approved instrument ruled inadmissible. Accordingly, a field study was conducted in the city of Toronto to determine if an F (Fail) recorded on the ASD corresponded with subsequent measurements of the breath alcohol concentration (BrAC) made using the Intoxilyzer® 5000C, the evidential breath alcohol testing instrument used by the Toronto Police Service.

MATERIAL AND METHODS

This two year retrospective study took place between January 1st 1998 and December 31st 1999 in the city of Toronto (population approximately 2.3 million) in collaboration with the Toronto Police Service. The Intoxilyzer® 5000C (CMI Inc. Owensboro KY, USA) was the sole evidential breath alcohol testing instrument used by the Toronto Police Service and is designated by the Minister of Justice as an approved instrument in Canada. This instrument uses infrared light to measure the breath alcohol concentration (BrAC) (5) and has been found to be accurate and reliable both in laboratory and field studies (6–9). Information regarding the arrested drinking driver, including if and when an ASD was used, is entered into the instrument's software by the qualified breath technician. The Intoxilyzer® 5000C test results, times of the tests and the calibration checks are also recorded and stored in the instrument's memory. A calibration check is conducted for each breath test using a wet bath simulator (Model 34C Guth Laboratories Inc. Harrisburg, PA USA). The calibration checks are considered acceptable if the results are between 0.090 and 0.110 g/210 L at a target value of 0.100 g/210 L(10).

The BrACs are reported in this study as grams of alcohol in 210 litres of breath (g/210 L). This unit, which is widely used in the United States, is equivalent (when multiplied by 1000) to a BAC measured in milligrams of alcohol in 100 millilitres of blood (mg/100mL) when using the forensically acceptable blood to breath ratio of 2100 to 1. The Criminal

Table I

The Alcotest® 7410 GLC display and the corresponding BrAC ranges to which the ASD is calibrated

Alcotest® 7410 GLC Display	BrAC Range
Digital results	0.004–0.049 g/210 L
"A" (Alert)	0.050–0.099 g/210 L
"F" (Fail)	0.100 g./210 L +

Code of Canada and the Canadian Society of Forensic Sciences Alcohol Test Committee (ATC) recommendations use these units (mg/100 mL) to define BACs whether they are obtained from blood or breath samples (10). During the period of the study, thirteen Intoxilyzer® 5000Cs were used by the Toronto Police Service and the data stored in these instruments are the basis of this study. In Toronto, two breath tests are conducted at least fifteen minutes apart according to the requirements of the Criminal Code and the ATC (10). The BrAC of the first test was used in this study, as it was conducted closest to the time of the ASD test, which would allow for a lesser variability due to the elimination of alcohol than a test at a later time.

The approved screening device used in this study was the Alcotest® 7410 GLC (Draeger Canada Ltd. Mississauga, Ontario) and the Toronto Police Service used 103 of these devices during the study period. The Alcotest® 7410 GLC is a portable device, which measures BrAC using an electrochemical detector or fuel cell (11,12). The calibration of the Alcotest® 7410 GLC was conducted at least bi-weekly according to ATC recommendations (10) using a wet bath simulator with a target BrAC of 0.100 g/210 L.

A properly calibrated Alcotest® 7410 GLC provides an F (Fail) when the BrAC of the subject is 0.100 g/210 L or greater, an A (Alert) at BrACs between 0.050 and 0.099 g/210 L, and will provide a digital result at BrACs between 0.004 and 0.049 g/210 L (Table 1). The police can arrest the driver and demand a subsequent Intoxilyzer® 5000C test when the ASD records an F. A twelve hour driving suspension (without criminal sanctions) can be issued for drivers who obtain an A, while drivers in Ontario's graduated license program can have their licenses suspended (without criminal sanctions) for even the digital ASD results (i.e. BrACs < 0.050 g/210 L; Figure 1).

One practical limitation of this study was that no digital results are provided by the ASD when the BrACs were greater than 0.049 g/210 L and subsequent Intoxilyzer tests are not conducted on drivers unless an F is recorded by the ASD. Consequently, this study was limited to a comparison of the Alcotest® 7410 GLC results of an F (Fail) with confirmation or rejection of the subsequent Intoxilyzer® 500C results. The false negative rate could not be determined in this study as evidential breath alcohol tests are only conducted for an F response and not at lower ASD results.

RESULTS AND DISCUSSION

Between January 1st, 1998 and December 31st, 1999, Intoxilyzer® 5000C tests were conducted on 3,726 drinking drivers arrested by the Toronto Police Service. Of these tested drinking drivers, 811 (22%) were screened using the ASD, obtained an F, and had subsequent Intoxilyzer® 5000C tests conducted. The BrACs of these drivers based on the first Intoxilyzer® 5000C test ranged from 0.000 to 0.310 g/210 L (mean 0.134 g/210 L; Figure 2). At the time of the Intoxilyzer® 5000C test, 17 drivers (2.1%) had a BrAC < 0.080 g/210 L) and 117 (14.4%) had a BrAC < 0.100 g/210 L. However, the time between

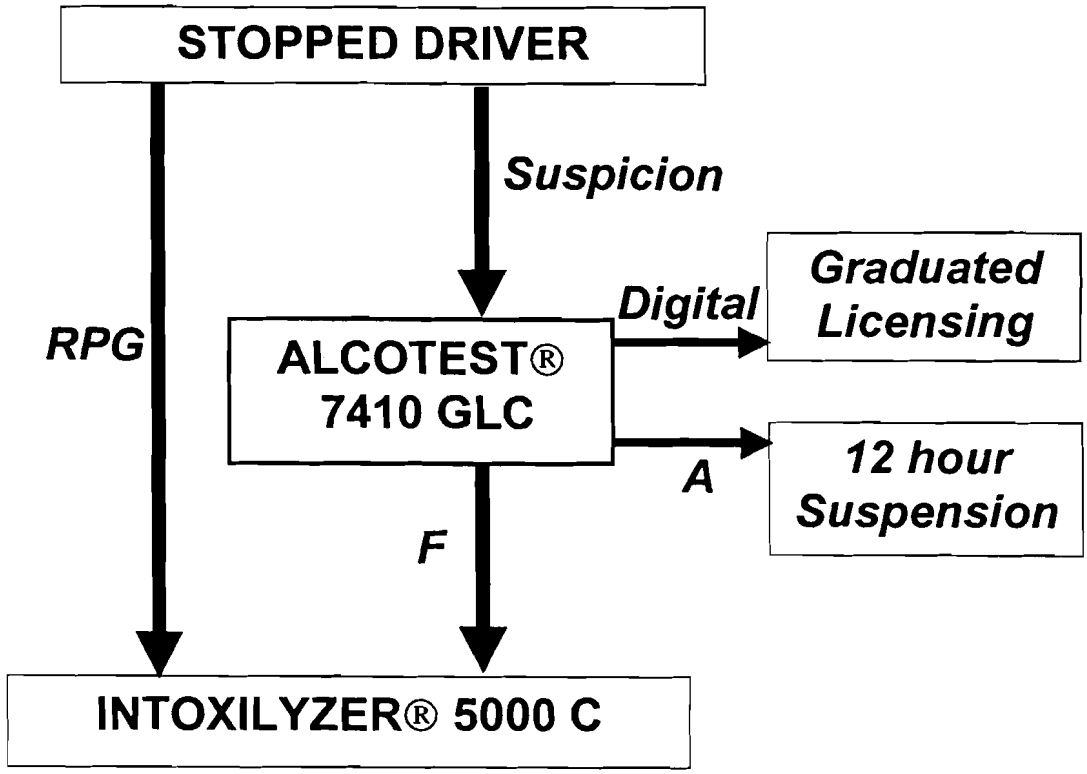

Figure 1. The procedure used by law enforcement officers in Ontario for processing suspected drinking drivers. When reasonable and probable grounds (RPG) are established, a police officer can demand a driver to provide breath samples into an approved instrument such as the Intoxilyzer® 5000C. When there is reasonable suspicion that the driver has alcohol in his/her body but not RPG, a screening test using an approved screening device such as the Alcotest® 7410GLC is warranted. A fail (F) result on the Alcotest® 7410GLC occurs when the BrAC is greater than 0.100 g/210 L, and gives the investigating officer RPG to demand an evidential breath test. An alert (A) corresponds to a BrAC between 0.050 and 0.099 g/210 L, and can result in a 12 hour driver's license suspension. A digital readout is provided when the BrAC is between 0.000 and 0.049 g/210 L and is used in the enforcement of the graduated licensing program in the Province of Ontario (see text for further details).

the ASD and Intoxilyzer® 5000C test ranged between 0.1 and 2.6 hours. The change in BrAC that can occur between the time of the ASD and that of the Intoxilyzer® 5000C can be estimated from pharmacokinetic data obtained from studies of drinking drivers. Using multiple blood sampling and urine tests it has been found that between 95 to 98% of drinking drivers are in the post-absorption phase at the time of testing (13–16). Therefore it is expected that very few drivers would have an increasing BrAC between the time of the ASD and the Intoxilyzer 5000C and so the false positive rate would not have been significantly increased.

The false positive rate, however, may be significantly decreased by compensating for the elimination of alcohol between the time of the ASD test and the time of the Intoxilyzer® 5000C result. The average rate of elimination in drinking drivers has been found to be approximately 0.019 g/210 L/h (17–19). If the time differences are considered and an average rate of alcohol elimination of 0.019 g/210 L/h is applied to estimate the

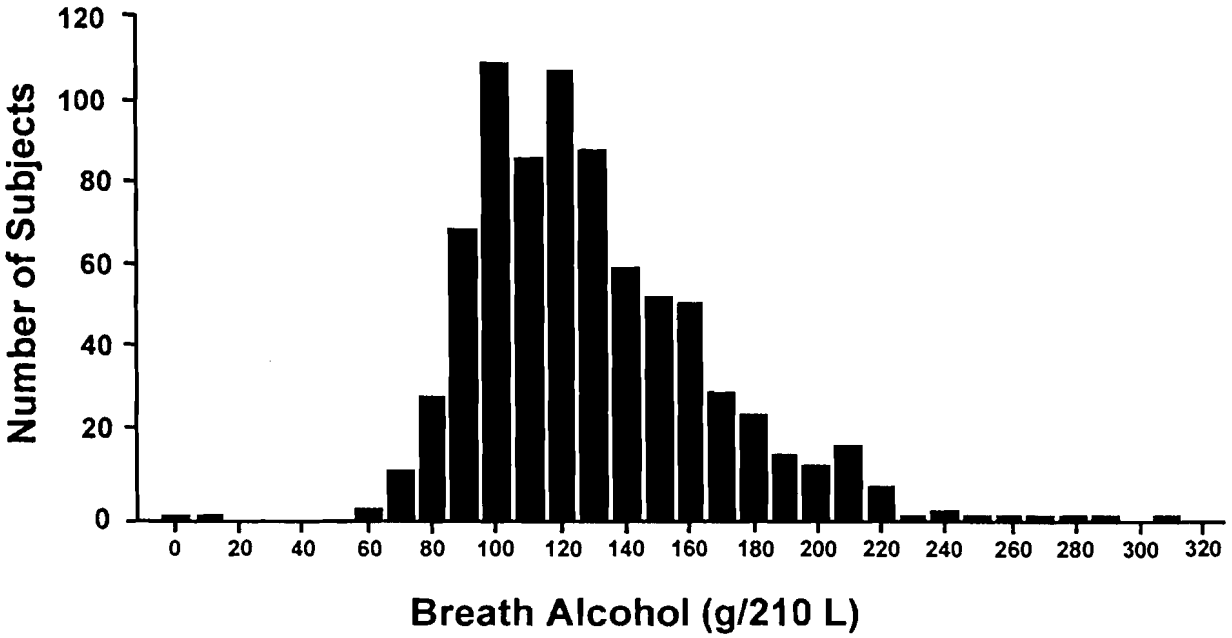

Figure 2. Distribution of the BrACs of 811 drivers, as determined by the Intoxilyzer® 5000C, who obtained an F on the Alcotest® 7410 G

Table 2

False positives of the Alcotest® 7410 GLC vs. the estimated BrAC at the time of the ASD test and Intoxilyzer® 5000C test

BrAC	Estimated BrAC at the time of the ASD test	BrAC at the time of the Intoxilyzer® 5000C test
<0.080 g/210 L	2 (0.2%)	17 (2.1%)
<0.100 g/210 L	12 (1.5%)	117 (14.4%)

BrAC at the time of the ASD test, the apparent false positive rate found in drinking drivers was much lower. Indeed, only two drivers (0.2%) had an estimated BrAC < 0.080 g/210 L at the time of the ASD test and only 12 drivers (1.5%) had an estimated BrAC < 0.100 g/210 L at the time of the ASD test (Table 2). Further investigation however, revealed that one of the two drivers with an estimated BrAC < 0.080 g/210 L (0.013 g/210 L) had surreptitiously used mouthwash (which contained alcohol) just prior to the ASD test. Therefore, this false positive was not due to the functioning of the Alcotest® 7410 GLC but to the mouth alcohol effect (20). No additional information was available for the other driver but it is reasonable to assume that the large discrepancy between the ASD and the evidential breath instrument was also due to the mouth alcohol effect in the field.

The low rate of false positive screening results in this study is more remarkable considering the ASD was operated under field conditions, which are less controlled than the evidential breath test conducted at the police station. In the field there are larger variations in environmental conditions such as temperature and humidity and there is little control as to recent alcohol consumption (mouth alcohol effects). In addition the calibration of the ASD is checked less frequently (approximately every two weeks) than the Intoxilyzer® 5000C, in which a calibration check is conducted prior to every subject breath test. Lastly, the ASD is mainly used by operators who have less training than the qualified technicians who operate the Intoxilyzer® 5000C.

CONCLUSIONS

The Alcotest® 7410 GLC has a low false positive screening rate when operated under field conditions by the police. Of the 811 drivers who obtained a FAIL on the ASD, only two drivers (0.2%) had an estimated BrAC of < 0.080 g/210 L at the time of the ASD test. Thus, the Alcotest® 7410 GLC is a robust and reliable instrument for screening drivers who are suspected of having elevated blood alcohol concentrations while operating a motor vehicle.

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