A five-year retrospective study of the approved instrument DataMaster DMT-C™ control tests

Jacques Tremblay[1], Geneviève Huppé[1*], Bernard Mathieu[1], Pascal Mireault[1]

[1]Laboratoire de sciences judiciaires et de médecine légale, Department of Toxicology
*Correspondence : genevieve.huppe@msp.gouv.qc.ca

Introduction

The evidential breath alcohol instrument DataMaster DMT-C™ is an approved instrument since April 9th 2008. In 2009, it was selected to replace the Alco-Sensor IV – RBT IV and the Intoxilyzer® 5000C in the Province of Quebec. In 2011, the Laboratoire de Sciences Judiciaires et de Médecine Légale started receiving requests for retrograde analysis. Based on the control test data contained in those files, an evaluation of the accuracy, precision and stability of the instrument was made.

Materials and Methods

The results obtained for control tests on the DataMaster DMT-C™ (Intoximeters Inc., St-Louis, MI) and the temperature of the wet-bath simulators used to generate the alcohol vapor (Guth Laboratories, models 2100 and 12V500, Harrisburg, PA) were collected for the period ranging from January 2011 to December 2015. The accuracy and precision of the instrument and simulators were calculated. The evaluation of the stability was based on the difference in alcohol level and temperature between the first and second control tests within the same sequence.

Results and Discussion

In Quebec the accepted value for control tests ranges from 95 to 105 mg% while a 90-110 mg% range is applied in the rest of Canada. As seen in Table 1, the mean control result for the 664 tests collected from the DataMaster DMT-C™ was 99,9 mg/100 mL (mg%). The instrument was accurate within 0.1% with a 99% confidence interval of 0,14 mg%. All control tests fell within the 95-105 mg% range. The instrument had a precision of 1,4 % based on the coefficient of variation (%CV). The error on the measurement was 2,7 mg%. As seen in Figure 1, the results were normally distributed.

Both simulators used had a mean temperature of 34°C (Table 2). The lack of temperature variation observed with the 2100 simulator results from only 1 decimal place being displayed. The 12V500 was accurate within 0,01% although the bias with an external reference could not be calculated. Its precision was 0,04% (%CV) with an error on the measure of 0,03°C. The temperature distribution obtained with the 12V500 can be seen in Figure 2.

Table 1: Accuracy and Precision of the DataMaster DMT-C

Control test (mg/100 mL)	
Number of tests	664
Average	99,9
Std Dev	1,4
Range	96 - 105
%CV	1,4
% diff from target	0,1
Uncertainty (95%)	2,7
C.I. (99%)	0,14

Figure 1: DataMaster DMT-C control results distribution

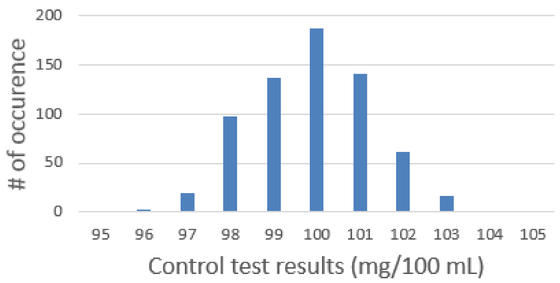


Table 2: Accuracy and Precision of the simulators

	Guth 12V500	Guth 2100
	Temperature (°C)	
Number of tests	534	130
Average	34,00	34,0
Std Dev	0,01	0,0
Range	33,92-34,04	34,0-34,0
%CV	0,04	0,0
% diff from target	0,01	0,0
Uncertainty (95%)	0,03	0,0
C.I. (99%)	0,002	0,0

Figure 2: Temperature distribution for the Guth 12V500 simulator

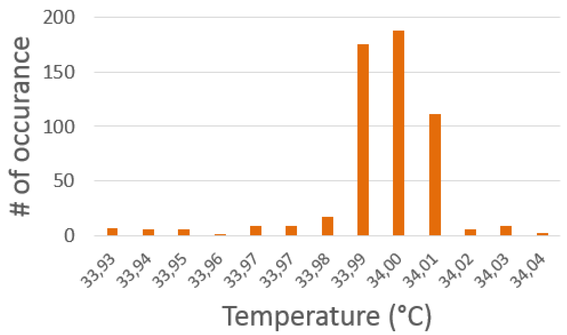


Figure 3: Stability of the DataMaster DMT-C™ and the Guth 12V500 simulator

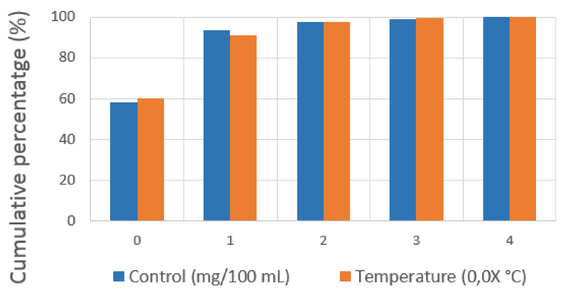
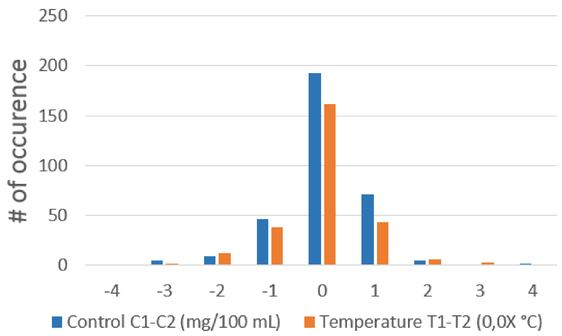


Figure 4: Variation within a control set



The DataMaster DMT-C™ shows great stability with 58% of control sets having the same value and 93% varying by 1 mg% or less (Figure 3). The variation, negative or positive, seems random (Figure 4) and is not correlated to the change in temperature of the simulator (data not shown).

Both simulators were stable. The 2100, with only one decimal displayed, did not show any temperature variation. The 12V500 simulator varied by 0,01°C or less in 91% of all control sets. The variation between the first and second control is shown in Figure 4. The prevalence of rise and fall of temperature within a control set is of similar amplitude. The acceptable temperature range for a simulator during a control test is 34,0 ± 0,2°C.

Conclusions

The accuracy, precision and stability of the approved instrument DataMaster DMT-CTM and associated simulators provide great confidence in the results obtained in the field. Its performance is equal to or better than the previously used instruments in the province of Quebec, the Intoxilyzer® 5000C and the Alco-Sensor IV – RBT IV(1).

The error on the measurement based solely on the analytical variation was estimated at 2.7 mg%. Based on this study, it is false to say that the error on this alcohol breath test instrument is ± 10 mg% and that 20 mg% should be subtracted from a breath test. Furthermore, the data presented here also support the narrower accepted range of the control test used in Quebec.

Reference

(1) Tremblay J. A Comparison of Paired Calibration Check Results of Alco-Sensor IV – RBT IV and Intoxylizer® 5000C in Real Cases. *Can. Soc. Forensic Sci. J.* 2013;46(2):112-119.

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