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Determination of the Mouth Alcohol Effect in Drinking Subject

by

B.R. Lalonde, M.P. Wilkie, and J.G. Wigmore

# DETERMINATION OF THE MOUTH ALCOHOL EFFECT IN DRINKING SUBJECTS

**B.R. LALONDE, M.P. WILKIE, AND J.G. WIGMORE.  
CENTRE OF FORENSIC SCIENCES,  
TORONTO, ONTARIO**

\*PRESENTED AT THE NOVEMBER 2001 CSFS MEETINGS IN TORONTO

## Introduction

The presence of residual alcohol in the oral cavity could potentially compromise the accuracy of the determination of a blood alcohol concentration (BAC) from a breath sample. Various measures including duplicate breath testing, mouth alcohol detectors and deprivation times have been adopted in order to prevent the occurrence of this mouth alcohol effect (MAE) (1). This effect has been the subject of a number of studies over the years, but most of the testing has involved subjects with baseline BACs of zero (2), rinsing their mouths with an alcoholic beverage and spitting the beverage out (3-5).

An earlier study from our laboratory (2) examined the mouth alcohol effect in subjects with BACs of zero who swallowed a mouthful of beer. Under these more realistic study conditions, it was determined that any significant MAE had disappeared by 10 minutes.

Here, similar conditions to those of Langille and Wigmore (2) were employed; however, in the present study MAE measurements were determined in subjects with BACs ranging from 40 – 115 mg/100 mL and the measurements repeated when the subjects were in an alcohol free state. This study was conducted to determine the MAE

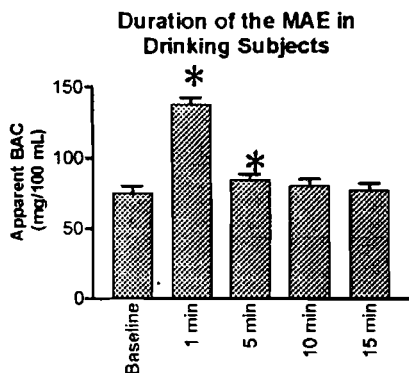
in individuals with positive BACs, following the consumption of a typical mouthful of beer.

## Methods

Twenty subjects (18 male and 2 female) consumed alcoholic beverages of their choice *ad libitum* for a period of one hour. At least one hour following completion of drinking, the baseline BACs of the subjects were determined using the Intoxilyzer 5000 C. The male and female subjects then rapidly consumed 85 mL and 37 mL of cold (<6°C) beer respectively. The volumes of beer are the average volumes consumed in a mouthful, as determined in an earlier study in which 15 male and 15 female subjects were asked to drink a "mouthful of beer" (Langille and Wigmore 2000). Subjects, using fresh mouthpieces, provided further breath samples at 1 minute, 5 minutes, and 15 minutes following the consumption of beer.

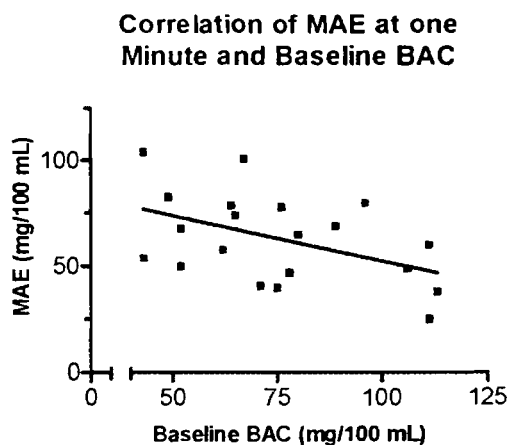
**For the alcohol-free portion of the study, subjects first provided breath samples to ensure a BACs of zero. The subjects then consumed beer as described above and provided breath samples at 1 minute, 5 minutes, and 15 minutes or until their resultant BACs had fallen to zero.**

## Results



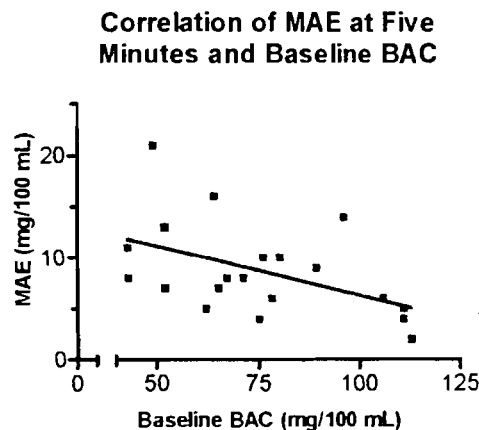
**Figure 1.** The apparent BAC in drinking subjects determined at 1, 5, 10, and 15 minutes following consumption of beer. Baseline represents the BAC (range: 43 – 113 mg/100 mL) prior to consumption of a mouthful of beer. Apparent BAC represents the BAC at the specified time after consumption of a mouthful of beer. \* denotes statistical significance ( $P < 0.05$ , ANOVA).

In the non-drinking control portion of the study, any significant MAE disappeared within 10 minutes of the consumption of a mouthful of beer. After 5 minutes, 5 subjects (25%) had MAEs of 10 mg/100 mL or greater. The highest MAE at 5 minutes was 16 mg/100 mL.



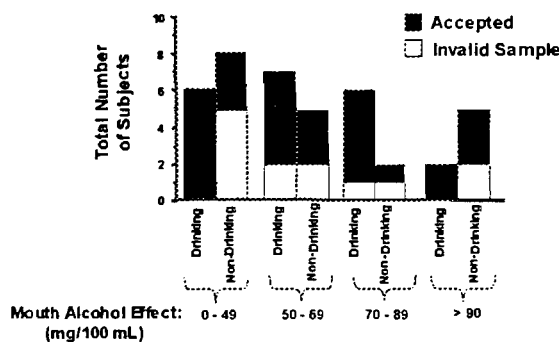
**Figure 2. a)** There was a significant negative correlation between MAE and Baseline BAC. MAE was

determined 1 minute after the consumption of a mouthful of beer in drinking subjects and was determined by subtracting the Baseline BAC from the Apparent BAC ( $P < 0.05$ ,  $r = -0.5$ ).



**Figure 2. b)** There was a significant negative correlation between MAE and Baseline BAC. MAE was determined 5 minutes after the consumption of a mouthful of beer in drinking subjects and was determined by subtracting the Baseline BAC from the apparent BAC ( $P < 0.05$ ,  $r = -0.5$ ).

### Mouth Alcohol Detection by the Intoxilyzer 5000C® Following Consumption of a Mouthful of Beer.



**Figure 3.** Determination of the ability of the Intoxilyzer 5000C to identify a MAE by registering an "INVALID SAMPLE" in drinking vs. non-drinking subjects. Subjects provided samples 1 minute after the consumption of a mouthful of beer.

Overall the Intoxilyzer 5000C responded to the MAE by registering an "INVALID SAMPLE" in 55% of non-drinking subjects and 15% of drinking subjects.

## Conclusions

1. The mouth alcohol effect from a mouthful of beer is eliminated within ten minutes in both drinking and non-drinking subjects.
2. When Baseline BACs are greater than 40 mg/100 mL, the MAE resulting from a mouthful of beer decreases as baseline BAC increases.
3. For MAE less than 100mg/100mL in magnitude, the Intoxilyzer 5000C is less effective at identifying the MAE in drinking subjects (BAC: 43 –113 mg/100mL) than non-drinking subjects.

## References

1. Logan B.K. and Distefano S. Ethanol Content of Various Foods and Soft Drinks and Their Potential for Interference With a Breath-alcohol Test. *J. Anal. Toxicol.* 1998; 22: 181-3.
2. Langille R.M. and Wigmore J.G. The Mouth Alcohol Effect After a Mouthful of Beer Under Social Conditions. *Can. Soc. Forens. Sci. J.* 2000; 33: 193-8.
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4. Dubowski K.M. Studies in Breath Alcohol Analysis: Biological Factors. *Z. Rechtsmed.* 1975; 76:93-117.
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## ANNOUNCEMENT

I am pleased to announce that the next Chair of the Toxicology Section of the CSFS, by acclamation, is:

**Daryl Mayers**  
of the  
Centre of Forensic Sciences  
in Toronto

Daryl is a graduate of the University of Saskatoon and has been a member of the Toxicology Section at CFS for close to 10 years. In addition to investigative and analytical work, Daryl has, and continues to be, invited to address lawyers, crowns and even detective novelists!

Daryl is committed to continuing the leadership of past chairs and providing a Section that responds to the needs and challenges of Toxicologists in Forensic Science in Canada.

Join me in congratulating Daryl and hopefully you will all get a chance to meet him in Vancouver in 2003!

Answers to the "Test Your Knowledge" from Vol26.(2) issue of *ToxiLogic*:

1C; 2E; 3A; 4D; 5C; 6C;  
7C; 8D; 9B; 10C.