

The Bac(chus) experiment: blood alcohol concentrations after wine tasting

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Abstract

Blood alcohol concentrations (BACs) were measured in ten volunteers after a wine tasting event with and without the swallowing of 15 mL of each wine. In case ten wines were tasted within one hour without swallowing, buccal mucosa absorption did not result in problematic BAC's; however in case 15 mL of each wine was swallowed, BAC's may exceed the legal driving limit of most countries. It is recommended to eat beforehand, but also to wait at least one hour after the session before driving back home.

Introduction

Wine tasting events are part of the culture of wine drinking and have become popular even in non-wine growing countries. During such a session a number of wines are tasted and discussed mostly supervised and commented by a connoisseur. Sometimes the session is followed by a dinner, but sometimes it stands on its own. Although the wines are not fully consumed, even the contact of the wine with the buccal mucosa may lead to alcohol absorption. Whether this causes a significant increase in blood alcohol concentration (BAC), which may be relevant with regard to joining traffic after the session is hardly known. We therefore organized two sessions of wine tasting. In the first session the wine was only rinsed through the mouth and it was not allowed to swallow the wine. In the second session, two weeks later, the wine was rinsed through the mouth and about 15 mL of each wine was consumed. Blood alcohol concentrations were measured fifteen minutes after the session.

Materials and Methods

Ten hospital employees, including the three authors, participated in the Bacchus experiment. The six men and four women, ages ranging from 30-60 years, were all healthy volun-

teers, using no medication and were not known with alcohol or drugs abuse. Liver biochemistry including gamma glutamyl peptidase, aspartate aminotransferase, alanin aminotransferase and carboxy deficient transferrin as well as routine hematological tests including mean corpuscular volume prior to the study were normal in all.

Study protocol

The participants abstained from consuming alcohol 24 h before each experiment. During the day of the wine tasting, which started at 6.00 p.m., they had had normal breakfast and lunch. The time interval between lunch and the start of the wine tasting was the same for all participants being 4.5 h. During each session ten wines, five white ones and five red ones were tasted. Alcohol percentages of the wines ranged from 11.5-13.5%.

The actual protocol of the wine tasting was developed in consultation with a professional wine taster and wine journalist. In the first experiment the participants were asked to rinse 15 mL of the wine through the mouth during two periods of fifteen seconds with an interval of one minute. After each period of fifteen seconds the mouth was washed with water. Interval time between each wine was five minutes except between wine five and six, switch from white to red, when it was ten minutes.

In the second session, which took place two weeks after the first one, the protocol was identical with the exception that after the second rinsing 15 mL of the wine was consumed. No bread or food were consumed during the sessions.

Fifteen minutes after the last wine, so about one hour after the start of the experiment, blood samples were taken for BAC analysis by an enzymatic method on a Beckman Counter Analyzer.

Results

Table 1 shows gender, weight, height and body mass index (BMI) of the ten participants. Volunteers 1-7 also participated in the second experiment in which 15 mL of each wine was consumed. In the first experiment BAC's were detectable but stayed low and under the legal driving limit of the Netherlands (Figure 1A). However in the second experiment five of the seven volunteers reached a BAC above this limit (Figure 1B). The two lowest BAC levels were observed in the two men with the greatest height, the two highest levels in two women with the lowest BMI.

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Discussion

Although wine tastings have become very popular, little is known about their effect on blood alcohol concentrations. This study shows the results of two ends of the spectrum of such a wine tasting event. On the one end wines are only tasted by rinsing through the mouth and no wine is swallowed, reflecting purely the absorption of alcohol by the buccal mucosa. On the other end the wine was not only rinsed but also 15 mL of each wine was consumed reflecting both buccal and intestinal absorption. During most wine tasting events some wine will be swallowed and therefore the second experiment probably reflects best the situation in practice. In that case the participants risk reaching a BAC above the legal driving limit, which may have great consequences especially if they want to drive a car after the session and thus relevant information for each individual who enjoys their glass of wine. The highest BAC levels were observed in two women with the lowest BMI, indicating that peak levels are also related to gender and BMI.

Alcohol is a small, light and weakly charged molecule that is easily absorbed from the mucosa through the process of diffusion.¹ The rate of absorption depends on the location, being quicker in the small bowel and slower in the stomach, and whether or not the stomach is empty, absorption being faster with an empty stomach. Furthermore the alcohol concentration of the drink plays a role; concentrations exceeding 20 vol% inhibit gastric emptying and absorption.² Although it is known from studies going back to the forties of the last century, that alcohol is absorbed by the buccal mucosa, data on this topic are limited. Depending on the alcohol concentration of the drink, about half of it is absorbed within 15-20

Table 1. Gender, weight, height and body mass index of the ten participants.

Participant no.	Sex	Weight (kg)	Height (cm)	BMI
1	Male	90	185	26,3
2	Male	85	180	26,2
3	Male	95	195	25,0
4	Female	70	185	20,5
5	Female	65	175	21,2
6	Male	75	195	19,7
7	Male	80	190	22,2
8	Female	60	180	18,5
9	Female	60	178	18,9
10	Female	55	160	21,5

BMI, body mass index.

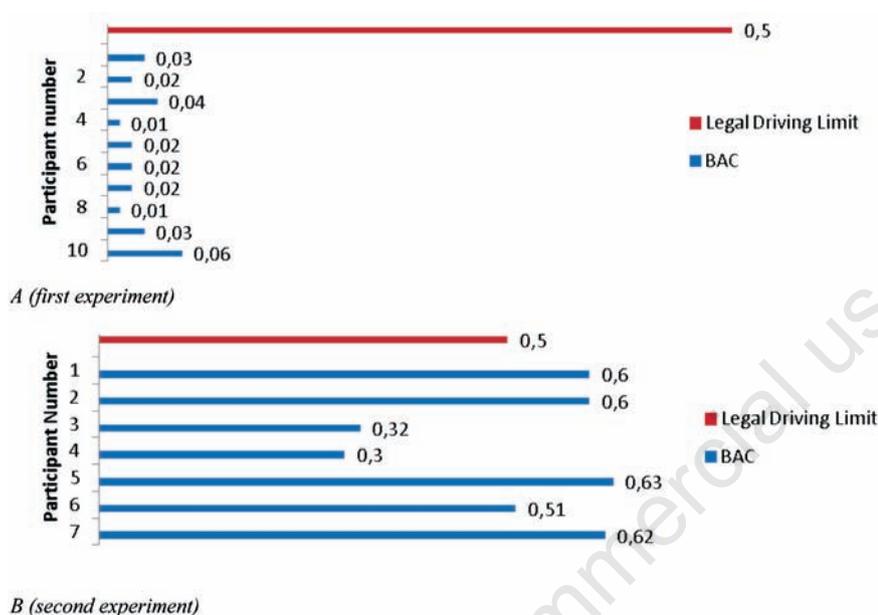


Figure 1. Blood alcohol concentration (BAC) after wine tasting with only buccal absorption (A) and with buccal and intestinal absorption (B).

s, with higher concentrations taking longer. Almost all alcohol and its metabolites are removed from the body by the liver; only a small proportion is excreted unchanged through sweat and urine. It takes about one hour to eliminate the alcohol being present in one glass of wine.

There is an argument to be made that BAC's in our second experiment overestimates the effects when participating a wine tasting event in daily practice. The wines were consumed on a relatively empty stomach and no food, not even a piece of bread, was consumed. Food may have an inhibitory effect on gastric motil-

ity and slow the passage of alcohol from the stomach to the duodenum, where most of the alcohol is absorbed. In some wine tasting events bread is served and can be consumed between the wines. Ten wines were tasted and partly consumed within 50 min, while in many tastings more time will be used on information and discussion about the properties and qualities of the wines. BAC's were measured fifteen minutes after the last wine, so about 60-70 min after the start of the session. In that period most of the alcohol is absorbed while hardly any alcohol is metabolized. So, one may assume that the peak concentration is measured and most participants of a wine tasting will not leave the place immediately at that time. On the other hand during many tastings the actual amount of wine consumed may be higher than in our experiment or people will have an extra glass of the wine they prefer.

In our second experiment 15 mL of each wine was ingested totaling 150 mL corresponding with 1.5-2 glasses. Since it takes about one hour to break down the alcohol content of one glass, it can be calculated how much time is needed to reach a safe level to join traffic. In practice it is recommendable to overestimate one's consumption rather than to try to be precise.

We can conclude that in a wine tasting event not much of the alcohol will be absorbed by the buccal mucosa and this will not lead to problematic BAC's. However when some of the wine is actually consumed, which is the actual situation in most sessions, BAC's may exceed the legal driving limit and the participant should be aware of this. Not only eating beforehand, but waiting some time (in relation with the amount consumed) after the session is recommended before driving back home.

References

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