The DRAM, Vol. 6(4) – Alcohol$_2$O: The effect of oxygen-enriched drinks on blood alcohol concentration

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It takes three oxygen molecules for humans to metabolize one molecule of alcohol (i.e., ethanol). This week the DRAM reviews a study that compares the blood alcohol concentration (BAC) levels of participants after drinking oxygen-enriched drinks to their BAC level after drinking normal drinks (Baek, Lee, & Kwon, 2010).

Methods

- Participants (n=49) were healthy adults who volunteered for up to three experiments that comprised this research. Investigators used thirty participants for each experiment; ten participants participated in one experiment, nineteen participated in two, and eleven participants participated in all three.
- In each experiment, participants completed two phases in which they consumed 40 ml every 5 minutes of a drink that was 19.5% ethanol by volume and enriched with varying amounts of dissolved oxygen concentration. In one phase, the drink was "normal" (oxygen concentration of 8 parts per million [ppm]); in the other, it was oxygen-enriched. Drink volume and oxygen concentration of the enriched drink varied as follows:
    - Experiment 1 – 240 ml drink, 20 ppm (25 minutes to drink)
    - Experiment 2 – 360 ml drink, 20 ppm (40 minutes to drink)
    - Experiment 3 – 360 ml drink, 25 ppm (40 minutes to drink)
- The researchers measured BAC levels by collecting breath samples at regularly timed intervals.

Results

- Participants' maximum BAC levels and time to reach those levels did not differ significantly between phases for any of the experiments. Average

maximum BACs ranged from .040% to .041% for 240ml drinks, and from .056% to .066% for 360ml drinks.

- In all experiments, it took less time for participants to reach 0.000% BAC (i.e., completely metabolize the ingested alcohol) after drinking an oxygen-enriched drink than a normal drink (see Figure).
- The researchers did not observe BAC level differences between the drinks until approximately 150 minutes after consumption.

		Time to Reach 0.000% BAC [Mean Minutes (SD)]	p Value
Experiment 1 (n=30)	8 ppm	257.7 (41.6)	p<0.001
(240 ml)	20 ppm	237.7 (41.7)	
Experiment 2 (n=30)	8 ppm	357.8 (86.1)	p<0.005
(360 ml)	20 ppm	334.5 (77.8)	
Experiment 3 (n=30)	8 ppm	369.1 (72.5)	p<0.05
(360 ml)	25 ppm	342.1 (100.2)	

Figure. Time to reach 0.000% BAC in each experiment after consuming normal and oxygen-enriched drinks (adapted from Baek et al., 2010).

Limitations

- The researchers did not measure the subjective effects of each drink (e.g., how intoxicated did participants feel).
- The study used a small sample and several participants were used in multiple experiments.
- The maximum BAC levels measured in this study are all below the US legal limit of 0.08 BAC to drive (Insurance Institute for Highway Safety & Highway Loss Data Institute, 2010).

Discussion

The results indicate that oxygen-enriched drinks reduced BAC significantly faster than normal drinks. Based on these results, one could argue that oxygen-enriched drinks reduce BAC levels rapidly and might have the potential to lead to fewer alcohol-related negative consequences, such as traffic accidents. However, maximum BAC levels were similar for both types of drinks and did not diverge until more than 2 hours after consumption. There might also be unintended consequences of oxygen-enriched drinks; for example, people who enjoy feeling intoxicated might consume more alcohol than they otherwise would in an attempt to maintain their BAC levels. Future research should examine the subjective

effects of oxygen-enriched drinks as well as their effects at higher alcohol concentrations.

— Tasha Chandler

What do you think? Please use the comment link below to provide feedback on this article.

References

Baek, I. H., Lee, B. Y., & Kwon, K. I. (2010). Influence of dissolved oxygen concentration on the pharmacokinetics of alcohol in humans. Alcoholism: Clinical and Experimental Research, 34(5), 834-839.

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