The smoking/drinking connection: smoking reduces the effects of alcohol on postural reflexes

John W. Rohrbaugh
Andrei B. Vedeniapin
Erik J. Sirevaag
Tracy L. Goldenberg
Rachel G. Sandy

See next page for additional authors

Follow this and additional works at: http://digitalcommons.wustl.edu/guzeposter2003

Part of the Medicine and Health Sciences Commons

Recommended Citation
Rohrbaugh, John W.; Vedeniapin, Andrei B.; Sirevaag, Erik J.; Goldenberg, Tracy L.; Sandy, Rachel G.; Ryan, Caroline; Rauscher, Molly M.; Sher, Kenneth J.; and Heath, Andrew C., "The smoking/drinking connection: smoking reduces the effects of alcohol on postural reflexes" (2003). Posters. Paper 2 Samuel B. Guze Symposium on Alcoholism.
http://digitalcommons.wustl.edu/guzeposter2003/2

This Poster is brought to you for free and open access by the 2003: Drinking and the High School Student at Digital Commons@Becker. It has been accepted for inclusion in Posters by an authorized administrator of Digital Commons@Becker. For more information, please contact engeszer@wustl.edu.
The Smoking/Drinking Connection: Smoking Reduces the Effects of Alcohol on Postural Reflexes

John W. Rohrbaugh, Andrei B. Vedeniapin, Erik J. Sirevaag, Tracy L. Goldenberg, Rachel G. Sandy, Caroline Ryan, Molly M. Rauscher, Kenneth J. Sher, Andrew C. Heath
Introduction

• This project (one of MARC’s three research components) brings into the laboratory a key theme of the center:

• **Smoking and heavy alcohol consumption are closely related.**
  
  – Adolescent smoking is a strong risk factor for heavy drinking.
  
  – Adult smokers are four to five times more likely to be heavy drinkers.
  
  – The majority of alcoholics also smoke.

• Laboratory findings can be related to interview and questionnaire data.
Hypothesis: Nicotine Reduces the Intoxicating Effects of Alcohol

- The hypothesis agrees with evidence from animal models for cross tolerance between nicotine and alcohol, and some supporting evidence from human studies (e.g. Madden et al., 1996).
- Studies by Schuckit and others show that persons with low levels of intoxication after receiving a laboratory dose of alcohol are at increased risk for becoming alcoholic—presumably because they are more tolerant of heavy drinking.
- Smoking-related tolerance for alcohol may thus be one route to heavy drinking.
Study Design

Subjects are tested in a laboratory protocol in which they are challenged with acute alcohol drinking and cigarette smoking, individually and in combination.

- Male and female young adults (ages 21-30).
- Data presented here are based on 27 subjects.
- Regular smokers.
- Social drinkers.

- Subjects are given detailed psychiatric and medical interviews, to facilitate comparisons between interview and laboratory findings, and to provide continuity with other MARC projects.
Methods: Procedures

- Subjects participate in four laboratory sessions, each 6-7 hrs in length and given in balanced order.
- The sessions involve the four combinations of Alcohol (or Placebo Alcohol) and Smoking (or Non-Smoking).
  - Placebo alcohol (A-S-).
  - Alcohol alone (A+S-).
  - Placebo alcohol plus cigarette smoking (A-S+).
  - Alcohol plus cigarette smoking (A+S+).
- Subjects smoke individual cigarettes at the 3 times indicated in the next figure.
- Testing is preceded by 3 hrs smoking deprivation.
Methods: Alcohol Dosing

- Alcohol is given orally, in an initial loading dose of 0.80 mg/kg lean body weight (0.56 g/kg for females) followed after 60 min by a small maintenance dose (0.075 g/kg for males, 0.053 mg/kg for females).
- Alcohol is meted out in four small cups over a 8 min period.

- Shown at right are BAC levels in the two sessions in which alcohol was administered.
- BAC levels peak between 0.05 and 0.06%.
- *Smoking does not affect BAC.*
- Dosing times are shown by vertical dashed lines.
Methods: Computerized Dynamic Posturography (CDP)

- CDP techniques yield separate tests of sensory and motor functions.
- Subjects stand on a moveable platform that can challenge balance by making abrupt movements, and also senses sway and shear forces kinematically.
- Visual surround can also be moved in phase with sway to distort normal cues to balance.
Motor control tests involve sudden rotational or translational movements of the support surface.

The corrective reflexes are studied using electromyographic (EMG) recordings from leg and trunk muscles.

Data shown here are from toes-up rotation.

The early, spinal stretch reflex in the gastrocnemius further destabilizes balance and must be corrected with a long-latency tibialis response involving long loops through the brain.

As shown in the next panel, the onset latency of the corrective tibialis reflex is prolonged (slowed) by even modest doses of alcohol.
Results: Dose-Related Effects of Alcohol on Latency of Long Loop Postural Reflexes

- Shown here are tibialis reflex latencies (toes-up condition) from a preliminary study of 12 subjects, who received four alcohol doses (placebo, 0.4, 0.8, 1.2 g/kg lbw, in separate sessions).

- Long loop reflexes were slowed by all doses.

- Early short spinal stretch reflexes were unaffected (not shown).

- These data attest to the extreme sensitivity of the long loop reflex latency measure to modest doses of alcohol.
Results: Effects of Alcohol and Smoking on Latency of Long Loop Postural Reflexes

• The onset latency of the corrective tibialis reflex was significantly prolonged by Alcohol, at each of the measurement times following dosing.

• Consistent with the overall hypothesis, the slowing of the long-loop tibialis reflex produced by Alcohol was significantly offset if subjects also Smoked.
Results: Effects of Alcohol and Smoking on Amplitude of Long Loop Postural Reflexes

• The amplitude of the corrective tibialis reflex was also significantly affected by alcohol and smoking.

• The reflex amplitude was significantly reduced by alcohol, and increased by smoking.

• Consistent with the overall hypothesis, the effects of alcohol on reflex amplitude were offset if subjects also smoked.
Results: Effects of Alcohol and Smoking on Latency of Early Spinal Stretch Reflexes

• In agreement with findings of other studies, the onset latency of the early gastrocnemius stretch reflex was not significantly affected by Alcohol or Smoking.

• These findings suggest that the effects on long loop reflexes (described above) are central in origin.
Conclusions

- Postural control was impaired by a modest dose of alcohol, as assessed using electromyographic (EMG) recordings of leg muscles following rapid toes-up perturbations of the support surface.
- Consistent with our overall hypothesis, the impairments were reduced when subjects also smoked.
- In accord with previous evidence that low reactivity to alcohol is a risk factor for alcoholism, these findings suggest that smoking may be causally involved in the development of heavy drinking.
- Responses in other domains (cardiorespiratory, subjective report) showed a mixture of effects suggesting that a variety of cross-tolerance, antagonistic, additive and sensitization processes are also present.