Alcohol and Sleep

Reviewing Alcohol's Effects on Normal Sleep

Alcoholism: Clinical & Experimental Research (ACER) is the official journal of the Research Society on Alcoholism and the International Society for Biomedical Research on Alcoholism. Co-authors of the ACER paper, "Alcohol and Sleep I: Effects on Normal Sleep," were: Colin M. Shapiro of the Department of Psychiatry and Ophthalmology at the University of Toronto; and Adrian J. Williams and Peter B. Fenwick of the London Sleep Centre. This release is supported by the Addiction Technology Transfer Center Network at http://www.ATTCnetwork.org

- Sleep cycles between two states: rapid eye movement (REM) and non-rapid eye movement (NREM) sleep.
- A review of all studies involving normal volunteers has clarified that alcohol shortens the time it takes to fall asleep, increases deep sleep, and reduces REM sleep.

Sleep is supported by natural cycles of activity in the brain and consists of two basic states: rapid eye movement (REM) sleep and non-rapid eye movement (NREM) sleep. Typically, people begin the sleep cycle with NREM sleep followed by a very short period of REM sleep, then continue with more NREM sleep and more REM sleep, this 90 minute cycle continuing through the night. A review of all known scientific studies on the impact of drinking on nocturnal sleep has clarified that alcohol shortens the time it takes to fall asleep, increases deep sleep, and reduces REM sleep.

- "This review has for the first time consolidated all the available literature on the immediate effects of alcohol on the sleep of healthy individuals," said Irshaad Ebrahim, medical director at The London Sleep Centre as well as corresponding author for the study.
- "Certainly a mythology seems to have developed around the impact of alcohol on sleep," added Chris Idzikowski, director of the Edinburgh Sleep Centre. "It is a good time to review the research as the mythology seems to be flourishing more rapidly than the research itself. Also, our understanding of sleep has accelerated in the past 30 years, which has meant that some of the initial interpretations need to be revisited."

Some of the review's key themes are:

- At all dosages, alcohol causes a reduction in sleep onset latency, a more consolidated first half sleep, and an increase in sleep disruption in the second half of sleep.
- "This review confirms that the immediate and short-term impact of alcohol is to reduce the time it takes to fall asleep," said Ebrahim. "In addition, the higher the dose, the greater the impact on increasing deep sleep. This effect on the first half of sleep may be partly the reason some people with insomnia use alcohol as a sleep aid. However, the effect of consolidating sleep in the first half of the night is offset by having more disrupted sleep in the second half of the night."
- The majority of studies, across alcohol dose, age, and gender, confirm an increase in slow-wave sleep (SWS) in the first half of the night. SWS, often referred to as deep sleep, consists of stages 3 and 4 of NREM. During SWS, the body repairs and regenerates tissues, builds bone and muscle, and appears to strengthen the immune system. Alcohol's impact on SWS in the first half of the night appears to be more robust than its effect on REM sleep. "SWS or deep sleep generally promotes rest and restoration," said Ebrahim. "However, when alcohol increases SWS, this may also increase vulnerability to certain sleep problems such as sleepwalking or sleep apnoea in those who are predisposed."
- Alcohol's effects on REM sleep in the first half of sleep appear to be dose related.

Low and moderate doses show no clear effects on REM sleep in the first half of the night, whereas at high doses, REM sleep reduction in the first part of sleep is significant. Total night REM sleep percent is decreased in the majority of studies at moderate and high doses.

> "Dreams generally occur in the REM stage of sleep," said Ebrahim. "During REM sleep the brain is more active, and may be regarded as 'defragmenting the drive.' REM sleep is also important because it can influence memory and serve restorative functions. Conversely, lack of REM sleep can have a detrimental effect on concentration, motor skills, and memory. REM sleep typically accounts for 20 to 25 percent of the sleep period."

- The onset of the first REM sleep period is significantly delayed at all doses and appears to be the most recognizable effect of alcohol on REM sleep, followed by a reduction in total night REM sleep.
- "One consequence of a delayed onset of the first REM sleep would be less restful sleep," said Idzikowski. "The first REM episode is often delayed in stressful environments. There is also a linkage with depression."

- Ebrahim agreed. "One hypothesis is that alcohol acts like medications that are used for depression and anxiety," he added. "Studies on patients with depression have identified that untreated patients had excessive REM sleep, particularly in the early part of the night, and that antidepressant medication suppressed REM sleep. Alcohol acts like antidepressants, reducing REM sleep particularly in the first part of the night. This impact of alcohol on REM sleep may explain the mood elevation and anxiety reduction associated with alcohol use."

- "This review really helps to clarify findings to date as they apply to normal individuals," said Idzikowski. "The high attrition rate from 153 to 20 published studies that were examined enables us to know the real state of play regarding the impact of alcohol on normal volunteers. Whilst some of the studies were rejected on methodological grounds, many were rejected because they were on physically or mentally disordered individuals."

- Both Ebrahim and Idzikowski hope this review will help readers understand that short-term alcohol use only gives the impression of improving sleep, and it should not be used as a sleep aid.

- "In sum," said Idzikowski, "alcohol on the whole is not useful for improving a whole night's sleep. Sleep may be deeper to start with, but then becomes disrupted. Additionally, that deeper sleep will probably promote snoring and poorer breathing. So, one shouldn't expect better sleep with alcohol."

Alcohol disrupts sleep homeostasis.

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Abstract:

Alcohol is a potent somnogen and one of the most commonly used 'over the counter' sleep aids. In healthy non-alcoholics, acute alcohol decreases sleeplatency, consolidates and increases the quality (delta power) and quantity of NREM sleep during the first half of the night. However, sleep is disrupted during the second half. Alcoholics, both during drinking periods and during abstinences, suffer from a multitude of sleep disruptions manifested by profound insomnia, excessive daytime sleepiness, and altered sleep architecture. Furthermore, subjective and objective indicators of sleep disturbances are predictors of relapse. Finally, within the USA, it is estimated that societal costs of alcohol-related sleep

disorders exceeds $18 billion. Thus, although alcohol-associated sleepproblems have significant economic and clinical consequences, very little is known about how and where alcohol acts to affect sleep. In this review, we have described our attempts to unravel the mechanism of alcohol-induced sleep disruptions. We have conducted a series of experiments using two different species, rats and mice, as animal models. We performed microdialysis, immunohistochemical, pharmacological, sleep deprivation and lesion studies which suggest that the sleep-promoting effects of alcohol may be mediated via alcohol's action on the mediators of sleep homeostasis: adenosine (AD) and the wake-promoting cholinergic neurons of the basal forebrain (BF). Alcohol, via its action on AD uptake, increases extracellular AD resulting in the inhibition of BF wake-promoting neurons. Since binge alcohol consumption is a highly prevalent pattern of alcohol consumption and disrupts sleep, we examined the effects of binge drinking on sleep-wakefulness. Our results suggest that disrupted sleep homeostasis may be the primary cause of sleep disruption observed following binge drinking. Finally, we have also shown that sleep disruptions observed during acute withdrawal, are caused due to impaired sleep homeostasis. In conclusion, we suggest that alcohol may disrupt sleep homeostasis to cause sleep disruptions.

SLEEP FOLLOWING ALCOHOL INTOXICATION IN HEALTHY, YOUNG ADULTS: EFFECTS OF SEX AND FAMILY HISTORY OF ALCOHOLISM

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Abstract

Background—This study evaluated sex and family history of alcoholism as moderators of subjective ratings of sleepiness/sleep quality and polysomnography following alcohol intoxication in healthy, young adults.

Methods—Ninety-three healthy adults (mean age 24.4 ± 2.7 years, 59 women, 29 subjects with a positive family history of alcoholism (FH+)) were recruited. Following screening polysomnography, participants consumed alcohol (sex/weight adjusted dosing) to intoxication (peak breath alcohol concentration [BrAC] of 0.11 ± 0.01 g% for men and women) or matching placebo between 2030 and 2200 hours. Sleep was monitored with polysomnography between 2300 and 0700 hours. Participants completed the Stanford Sleepiness Scale and Karolinska Sleepiness Scale at bedtime and on awakening and a validated post-sleep questionnaire.

Results—Following alcohol, total sleep time, sleep efficiency, nighttime awakenings, and wake after sleep onset were more disrupted in women than men, with no differences by family history status. Alcohol reduced sleep onset latency, sleep efficiency, and REM sleep while increasing wakefulness and Slow Wave Sleep across the entire night compared to placebo. Alcohol also generally increased sleep consolidation in the first half of the night, but decreased it during the second half. Sleepiness ratings were higher following alcohol, particularly in women at bedtime. Morning sleep quality ratings were lower following alcohol than placebo.

Conclusions—Alcohol intoxication increases subjective sleepiness and disrupts sleep objectively more in healthy women than in men, with no differences evident by family history of alcoholism status. Evaluating moderators of alcohol effects on sleep may provide insight into the role of sleep in problem drinking.