# Cigarette Smoking Exacerbates Alcohol-Induced Brain Damage

ScienceDaily (Dec. 30, 2004) — The substances most frequently used by alcohol-dependent individuals are tobacco products; roughly 80 percent of alcohol-dependent individuals report smoking regularly. Although brain morphology, neurometabolism, and neurocognition are known to be adversely affected by chronic, heavy alcohol consumption, little research has examined the independent effects of cigarette smoking or its potentially compounding effects on alcohol-induced brain damage. A study in the December issue of Alcoholism: Clinical & Experimental Research has found that cigarette smoking can both exacerbate alcohol-induced damage as well as independently cause brain damage.

"While the effects of cigarette smoking on the heart, lungs, central and peripheral vascular systems, and its carcinogenic properties have been studied for many years in humans, very little is known about its effects on the brain and its functions," said Timothy C. Durazzo, a neuropsychologist and neuroscience researcher at the San Francisco Veterans Administration Medical Center and corresponding author for the study. "A mere handful of studies indicate that chronic cigarette smoking by itself has adverse effects on brain structure and cognitive functioning. However, to date, we are not aware of any published studies using magnetic resonance imaging methods on human brains that have shown cigarette smoking compounds alcohol-induced damage."

What is known, said Durazzo, is that smokers tend to consume more alcohol than non-smokers. It is also known that chronic alcohol dependence can damage alcoholics' brains, particularly the frontal lobes, which are critically involved in higher-order cognitive functions such as problem solving, reasoning, abstraction, planning, foresight, short-term memory, and emotional regulation. "So, is all the brain damage described in alcoholics in treatment due to chronic excessive alcohol consumption," asked Durazzo, "or does chronic comorbid smoking also contribute to some of the damage observed?"

Researchers compared 24, one-week-abstinent alcoholics (14 smokers, 10 nonsmokers) in treatment with 26 light-drinking "controls" (7 smokers, 19 nonsmokers) on magnetic resonance spectroscopic imaging measures of common brain metabolites in gray and white matter of the major lobes, basal ganglia, midbrain and cerebellar vermis. Measures of neurocognitive functioning and laboratory markers of drinking severity and nutritional status were also compared.

"Results indicate that chronic cigarette smoking increases the severity of brain damage associated with alcohol dependence," said Durazzo. "That is, the combined effects of alcohol dependence and chronic smoking are associated with greater regional brain damage than chronic alcoholic drinking or smoking alone. Our studies show that this exacerbation of the alcohol-induced brain damage is most prominent in the frontal lobes of individuals studied early in treatment."

Durazzo noted that frontal-lobe functions are applied in multiple contexts of everyday life. "Therefore, exacerbation of alcohol-induced damage to the tissue of the frontal lobes by chronic cigarette smoking may further compromise recovering alcoholics' ability to successfully execute more challenging activities of daily living or accurately judging or anticipating the consequences of their actions, particularly with increasing age," he said.

Cigarette smoking, independent of alcohol consumption, was also found to have adverse effects on neuronal viability and cell membranes in the midbrain and on cell membranes of the cerebellar vermis.

"These brain regions are involved in fine and gross motor functions and balance and coordination," said Durazzo. "We also observed that higher smoking severity among smoking recovering alcoholics was associated with lower N-acetylaspartate levels in lenticular nuclei and thalamus, areas also involved in motor functions." N-acetylaspartate is an amino acid derivative and its concentration is used as a measure of neuronal viability. "Together, these findings may indicate a particular vulnerability of subcortical structures to the effects of cigarette smoking," he said.

Durazzo added that these findings have significant implications for both alcohol researchers as well as the general population.

"Our results give strong preliminary evidence that chronic cigarette smoking, a behavior that commonly is associated with alcohol dependence, has a significant impact on the integrity of tissue in several brain regions, particularly the frontal lobes and cerebellum," he said. "Previous research has largely ignored the possible effects that comorbid cigarette smoking may have on the brain. These risks exist above and beyond the increased risk for cancer, and cardiovascular, cerebrovascular and pulmonary disease. At this point, it is unclear if the brain injury and cognitive compromise associated with chronic smoking shows recovery during a sustained period of smoking cessation, or if continued smoking during abstinence from alcohol affects recovery from alcohol-induced impairment. These are important topics that need to be investigated in the future."

Durazzo added that chronic cigarette smoking is also commonly seen in other neuropsychiatric conditions such as schizophrenia, depressive disorders and anxiety disorders. "Any neuroimaging and/or neurocognitive investigation of these conditions should consider the potential impact of smoking on outcome measures," he said. "Given the growing evidence that cigarette smoking has adverse effects on brain structure, brain metabolites and function, consideration of the potential effects of smoking may be particularly important in medication trails for the above conditions, where participants may respond differentially based on their smoking status."

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, "Cigarette smoking exacerbates chronic, alcohol-induced brain damage," were Stefan Gazdzinski and Dieter J. Meyerhoff of the San Francisco Veterans Administration Medical Center and the Department of Radiology at the University of California, San Francisco; and Peter Banys of the San Francisco Veterans Administration Medical Center and the Department of Psychiatry at the University of California, San Francisco. The study was funded by the National Institute on Alcohol Abuse and Alcoholism.

**Story Source:** The above story is reprinted (with editorial adaptations by ScienceDaily staff) from materials provided by [**Alcoholism: Clinical & Experimental Research**](http://www.alcoholism-cer.com/)**.**