

## Alcohol's Damaging Effects on the Brain

Difficulty walking, blurred vision, slurred speech, slowed reaction times, impaired memory: Clearly, alcohol affects the brain. Some of these impairments are detectable after only one or two drinks and quickly resolve when drinking stops. On the other hand, a person who drinks heavily over a long period of time may have brain deficits that persist well after he achieves sobriety. Exactly how alcohol affects the brain and the likelihood of reversing the impact of heavy drinking on the brain remain hot topics in alcohol research today.

We do know that heavy drinking may have extensive and far-reaching effects on the brain, ranging from simple “slips” in memory to permanent and debilitating conditions that require lifetime custodial care. And even moderate drinking leads to short-term impairment, as shown by extensive research on the impact of drinking on driving.

A number of factors influence how and to what extent alcohol affects the brain, including

- how much and how often a person drinks
- the age at which she first began drinking, and how long she has been drinking
- the person's age, level of education, gender, genetic background and family history of alcoholism
- whether he is at risk as a result of prenatal alcohol exposure
- her general health status

### Blackouts and memory lapses

Alcohol can produce detectable impairments in memory after only a few drinks and, as the amount of alcohol increases, so does the degree of impairment. Large quantities of alcohol, especially when consumed quickly and on an empty stomach, can produce a blackout, or an interval of time for which the intoxicated person cannot recall key details of events, or even entire events.

Blackouts are much more common among social drinkers than previously assumed and should be viewed as a potential consequence of acute intoxication regardless of age or whether the drinker is clinically dependent on alcohol. A survey of 772 college undergraduates about their experiences with blackouts asked, “Have you ever awoken after a night of drinking not able to remember things that you did or places that you went?” Of the students who had ever consumed alcohol, 51 percent reported blacking out at some point in their lives, and 40 percent reported experiencing a blackout in the year before the survey. Of those who reported drinking in the two weeks before the survey, 9.4 percent said they blacked out during that time. The students reported learning later that they had participated in a wide range of potentially dangerous events they could not remember, including vandalism, unprotected sex and driving.

### **Binge drinking and blackouts**

Drinkers who experience blackouts typically drink too much and too quickly, which causes their blood alcohol level to rise very rapidly. College students may be at particular risk for experiencing a blackout, as an alarming number of college students engage in binge drinking. Binge drinking, for a typical adult, is defined as consuming five or more drinks in about two hours for men, or four or more drinks for women.

Equal numbers of men and women reported experiencing blackouts, despite the fact that the men drank significantly more often and more heavily than the women. This outcome suggests that regardless of the amount of alcohol consumption, females—a group infrequently studied in the literature on blackout—are at greater risk than males for experiencing blackouts. A woman's tendency to black out more easily probably results from differences in how men and women metabolize alcohol. Females also may be more susceptible than males to milder forms of alcohol-induced memory impairments, even when men and women consume comparable amounts of alcohol.

### **Are women more vulnerable to alcohol's effects on the brain?**

Women are more vulnerable than men to many of the medical consequences of alcohol use. For example, women with alcoholism develop cirrhosis, alcohol-induced damage of the heart muscle (i.e., cardiomyopathy) and nerve damage (i.e., peripheral neuropathy) after fewer years of heavy drinking than do men with alcoholism. Studies comparing men and women's sensitivity to alcohol-induced brain damage, however, have not been as conclusive.

### **Brain damage from other causes**

People who have been drinking large amounts of alcohol for long periods of time run the risk of developing serious and persistent changes in the brain. Damage may be a result of the direct effects of alcohol on the brain or may result indirectly, from a poor general health status or from severe liver disease.

For example, thiamine deficiency is a common occurrence in people with alcoholism and results from poor overall nutrition. Up to 80 percent of people with alcoholism have a deficiency in thiamine, and some of these people will go on to develop serious brain disorders such as Wernicke-Korsakoff syndrome (WKS). WKS is a disease that consists of two separate syndromes, a short-lived and severe condition called Wernicke's encephalopathy and a long-lasting and debilitating condition known as Korsakoff's psychosis.

The symptoms of Wernicke's encephalopathy include mental confusion, paralysis of the nerves that move the eyes (i.e., oculomotor disturbances) and difficulty with muscle coordination. For example, patients with Wernicke's encephalopathy may be too confused to find their way out of a room or may not even be able to walk. Many Wernicke's encephalopathy patients, however, do not exhibit all three of these signs

and symptoms, and clinicians working with people with alcoholism must be aware that this disorder may be present even if the patient shows only one or two of them. In fact, studies performed after death indicate that many cases of thiamine deficiency-related encephalopathy may not be diagnosed in life because not all the “classic” signs and symptoms were present or recognized.

Approximately 80 percent to 90 percent of people with alcoholism with Wernicke’s encephalopathy also develop Korsakoff’s psychosis, a chronic and debilitating syndrome characterized by persistent learning and memory problems. Patients with Korsakoff’s psychosis are forgetful and quickly frustrated and have difficulty with walking and coordination. Although these patients have problems remembering old information (i.e., retrograde amnesia), it is their difficulty in “laying down” new information (i.e., anterograde amnesia) that is the most striking. For example, these patients can discuss in detail an event in their lives, but an hour later might not remember ever having the conversation.

### Summary

People with alcoholism are not all alike. They experience different degrees of impairment, and the disease has different origins for different people. Consequently, researchers have not found conclusive evidence that any one variable is solely responsible for the brain deficits found in those with alcoholism. Characterizing what makes some people with alcoholism vulnerable to brain damage whereas others are not remains the subject of active research.

The good news is that most people with alcoholism with cognitive impairment show at least some improvement in brain structure and functioning within a year of abstinence, though some people take much longer. Clinicians must consider a variety of treatment methods to help people stop drinking and to recover from alcohol-related brain impairments, and tailor these treatments to the individual patient.

Advanced technology will have an important role in developing these therapies. Clinicians can use brain-imaging techniques to monitor the course and success of treatment, because imaging can reveal structural, functional and biochemical changes in living patients over time. Promising new medications also are in the early stages of development, as researchers strive to design therapies that can help prevent alcohol’s harmful effects and promote the growth of new brain cells to take the place of those that have been damaged by alcohol.

Source: National Institute on Alcohol Abuse and Alcoholism (NIAAA)