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 or she 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 (1), including

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

This Alcohol Alert reviews some common disorders associated with alcohol-related brain damage and the people at greatest risk for impairment. It looks at traditional as well as emerging therapies for the treatment and prevention of alcohol-related disorders and includes a brief look at the high-tech tools that are helping scientists to better understand the effects of alcohol on the brain.

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 (2). White and colleagues (3) surveyed 772 college undergraduates about their experiences with blackouts and 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 2 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 levels 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 2 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 blackouts—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 (4).

**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, alcoholic women develop cirrhosis (5), alcohol–induced damage of the heart muscle (i.e., cardiomyopathy) (6), and nerve damage (i.e., peripheral neuropathy) (7) after fewer years of heavy drinking than do alcoholic men. Studies comparing men and women’s sensitivity to alcohol–induced brain damage, however, have not been as conclusive.

Using imaging with computerized tomography, two studies (8,9) compared brain shrinkage, a common indicator of brain damage, in alcoholic men and women and reported that male and female alcoholics both showed significantly greater brain shrinkage than control subjects. Studies also showed that both men and women have similar learning and memory problems as a result of heavy drinking (10). The difference is that alcoholic women reported that they had been drinking excessively for only about half as long as the alcoholic men in these studies. This indicates that women’s brains, like their other organs, are more vulnerable to alcohol–induced damage than men’s (11).

Yet other studies have not shown such definitive findings. In fact, two reports appearing side by side in the American Journal of Psychiatry contradicted each other on the question of gender–related vulnerability to brain shrinkage in alcoholism (12,13). Clearly, more research is needed on this topic, especially because alcoholic women have received less research attention than alcoholic men despite good evidence that women may be particularly vulnerable to alcohol’s effects on many key organ systems.
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. Thiamine, also known as vitamin B1, is an essential nutrient required by all tissues, including the brain. Thiamine is found in foods such as meat and poultry; whole grain cereals; nuts; and dried beans, peas, and soybeans. Many foods in the United States commonly are fortified with thiamine, including breads and cereals. As a result, most people consume sufficient amounts of thiamine in their diets. The typical intake for most Americans is 2 mg/day; the Recommended Daily Allowance is 1.2 mg/day for men and 1.1 mg/day for women (14).

Wernicke–Korsakoff Syndrome

Up to 80 percent of alcoholics, however, have a deficiency in thiamine (15), and some of these people will go on to develop serious brain disorders such as Wernicke–Korsakoff syndrome (WKS) (16). 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 alcoholics 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.
Schematic drawing of the human brain, showing regions vulnerable to alcoholism-related abnormalities.

Approximately 80 to 90 percent of alcoholics 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 (17). 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.

**Treatment**—The cerebellum, an area of the brain responsible for coordinating movement and perhaps even some forms of learning, appears to be particularly sensitive to the effects of thiamine deficiency and is the region most frequently damaged in association with chronic alcohol consumption. Administering thiamine helps to improve brain function, especially in patients in the early stages of WKS. When damage to the brain is more severe, the course of care shifts from treatment to providing support to the patient and his or her family (18). Custodial care may be necessary for the 25 percent of patients who have permanent brain damage and significant loss of cognitive skills (19).

Scientists believe that a genetic variation could be one explanation for why only some alcoholics with thiamine deficiency go on to develop severe conditions such as WKS, but additional studies are necessary to clarify how genetic variants might cause some people to be more vulnerable to WKS than others.

**LIVER DISEASE**

Most people realize that heavy, long-term drinking can damage the liver, the organ chiefly responsible for breaking down alcohol into harmless byproducts and clearing it from the body. But people may not be aware that prolonged liver dysfunction, such as liver cirrhosis resulting from
excessive alcohol consumption, can harm the brain, leading to a serious and potentially fatal brain disorder known as hepatic encephalopathy (20).

Hepatic encephalopathy can cause changes in sleep patterns, mood, and personality; psychiatric conditions such as anxiety and depression; severe cognitive effects such as shortened attention span; and problems with coordination such as a flapping or shaking of the hands (called asterixis). In the most serious cases, patients may slip into a coma (i.e., hepatic coma), which can be fatal.

New imaging techniques have enabled researchers to study specific brain regions in patients with alcoholic liver disease, giving them a better understanding of how hepatic encephalopathy develops. These studies have confirmed that at least two toxic substances, ammonia and manganese, have a role in the development of hepatic encephalopathy. Alcohol–damaged liver cells allow excess amounts of these harmful byproducts to enter the brain, thus harming brain cells.

Treatment—Physicians typically use the following strategies to prevent or treat the development of hepatic encephalopathy.

- Treatment that lowers blood ammonia concentrations, such as administering L-ornithine L-aspartate.
- Techniques such as liver–assist devices, or “artificial livers,” that clear the patients’ blood of harmful toxins. In initial studies, patients using these devices showed lower amounts of ammonia circulating in their blood, and their encephalopathy became less severe (21).
- Liver transplantation, an approach that is widely used in alcoholic cirrhotic patients with severe (i.e., end–stage) chronic liver failure. In general, implantation of a new liver results in significant improvements in cognitive function in these patients (22) and lowers their levels of ammonia and manganese (23).

**ALCOHOL AND THE DEVELOPING BRAIN**

Drinking during pregnancy can lead to a range of physical, learning, and behavioral effects in the developing brain, the most serious of which is a collection of symptoms known as fetal alcohol syndrome (FAS). Children with FAS may have distinct facial features (see illustration). FAS infants also are markedly smaller than average. Their brains may have less volume (i.e., microencephaly). And they may have fewer numbers of brain cells (i.e., neurons) or fewer neurons that are able to function correctly, leading to long–term problems in learning and behavior.
Children with fetal alcohol syndrome (FAS) may have distinct facial features.

Treatment—Scientists are investigating the use of complex motor training and medications to prevent or reverse the alcohol–related brain damage found in people prenatally exposed to alcohol (24). In a study using rats, Klintsova and colleagues (25) used an obstacle course to teach complex motor skills, and this skills training led to a re–organization in the adult rats’ brains (i.e., cerebellum), enabling them to overcome the effects of the prenatal alcohol exposure. These findings have important therapeutic implications, suggesting that complex rehabilitative motor training can improve motor performance of children, or even adults, with FAS.

Scientists also are looking at the possibility of developing medications that can help alleviate or prevent brain damage, such as that associated with FAS. Studies using animals have yielded encouraging results for treatments using antioxidant therapy and vitamin E. Other preventive therapies showing promise in animal studies include 1–octanol, which ironically is an alcohol itself. Treatment with 1–octanol significantly reduced the severity of alcohol’s effects on developing mouse embryos (26). Two molecules associated with normal development (i.e., NAP and SAL) have been found to protect nerve cells against a variety of toxins in much the same way that octanol does (27). And a compound (MK–801) that blocks a key brain chemical associated with alcohol withdrawal (i.e., glutamate) also is being studied. MK–801 reversed a specific learning impairment that resulted from early postnatal alcohol exposure (28).

Though these compounds were effective in animals, the positive results cited here may or may not translate to humans. Not drinking during pregnancy is the best form of prevention; FAS remains the leading preventable birth defect in the United States today.

GROWING NEW BRAIN CELLS

For decades scientists believed that the number of nerve cells in the adult brain was fixed early in life. If brain damage occurred, then, the best way to treat it was by strengthening the existing
neurons, as new ones could not be added. In the 1960s, however, researchers found that new neurons are indeed generated in adulthood—a process called neurogenesis (29). These new cells originate from stem cells, which are cells that can divide indefinitely, renew themselves, and give rise to a variety of cell types. The discovery of brain stem cells and adult neurogenesis provides a new way of approaching the problem of alcohol–related changes in the brain and may lead to a clearer understanding of how best to treat and cure alcoholism (30).

For example, studies with animals show that high doses of alcohol lead to a disruption in the growth of new brain cells; scientists believe it may be this lack of new growth that results in the long–term deficits found in key areas of the brain (such as hippocampal structure and function) (31,32). Understanding how alcohol interacts with brain stem cells and what happens to these cells in alcoholics is the first step in establishing whether the use of stem cell therapies is an option for treatment (33).

**SUMMARY**

Alcoholics 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 alcoholics. Characterizing what makes some alcoholics vulnerable to brain damage whereas others are not remains the subject of active research (34).

The good news is that most alcoholics with cognitive impairment show at least some improvement in brain structure and functioning within a year of abstinence, though some people take much longer (35–37). 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.

**SIDEBAR**

**Using High–Tech Tools to Assess Alcoholic Brain Damage**

Researchers studying the effects of alcohol use on the brain are aided by advanced technology such as magnetic resonance imaging (MRI), diffusion tensor imaging (DTI), positron emission tomography (PET), and electrophysiological brain mapping. These tools are providing valuable insight into how alcohol affects the brain’s structure and function.

Long–term heavy drinking may lead to shrinking of the brain and deficiencies in the
fibers (white matter) that carry information between brain cells (gray matter). MRI and DTI are being used together to assess the brains of patients when they first stop chronic heavy drinking and again after long periods of sobriety, to monitor for possible relapse to drinking (38).

Memory formation and retrieval are highly influenced by factors such as attention and motivation (39). Studies using MRI are helping scientists to determine how memory and attention improve with long-time abstinence from alcohol, as well as what changes take place when a patient begins drinking again. The goal of these studies is to determine which alcohol-induced effects on the brain are permanent and which ones can be reversed with abstinence.

PET imaging is allowing researchers to visualize, in the living brain, the damage that results from heavy alcohol consumption (40). This “snapshot” of the brain’s function enables scientists to analyze alcohol’s effects on various nerve cell communication systems (i.e., neurotransmitter systems) as well as on brain cell metabolism and blood flow within the brain. These studies have detected deficits in alcoholics, particularly in the frontal lobes, which are responsible for numerous functions associated with learning and memory, as well as in the cerebellum, which controls movement and coordination. PET also is a promising tool for monitoring the effects of alcoholism treatment and abstinence on damaged portions of the brain and may help in developing new medications to correct the chemical deficits found in the brains of people with alcohol dependence.

Another high-tech tool, electroencephalography (EEG), records the brain’s electrical signals (41). Small electrodes are placed on the scalp to detect this electrical activity, which then is magnified and graphed as brain waves (i.e., neural oscillations). These brain waves show real-time activity as it happens in the brain.

Many male alcoholics have a distinctive electrophysiological profile—that is, a low amplitude of their P3 components (see figure). P3 amplitudes in women alcoholics also are reduced, although to a lesser extent than in men. For many years it was assumed that the P3 deficit observed in alcoholics was the result of alcohol’s damage to the brain. Then it was determined that while many of the clinical symptoms and electrophysiological measures associated with alcoholism return to normal after abstinence, the P3 amplitude abnormality persists (42).
For many people, the facts about alcoholism are not clear. What is alcoholism, exactly? How does it differ from alcohol abuse? When should a person seek help for a problem related to his or her drinking? The National Institute on Alcohol Abuse and Alcoholism (NIAAA) has prepared this booklet to help individuals and families answer these and other common questions about alcohol problems. The following information explains both alcoholism and alcohol abuse, the symptoms of each, when and where to seek help, treatment choices, and additional helpful resources.

**A Widespread Problem**

For most people who drink, alcohol is a pleasant accompaniment to social activities. Moderate alcohol use—up to two drinks per day for men and one drink per day for women and older people—is not harmful for most adults. (A standard drink is one 12-ounce bottle or can of either beer or wine cooler, one 5-ounce glass of wine, or 1.5 ounces of 80-proof distilled spirits.) Nonetheless, a large number of people get into serious trouble because of their drinking. Currently, nearly 14 million Americans—1 in every 13 adults—abuse alcohol or are alcoholic. Several million more adults engage in risky drinking that could lead to alcohol problems. These patterns include binge drinking.
and heavy drinking on a regular basis. In addition, 53 percent of men and women in the United States report that one or more of their close relatives have a drinking problem.

The consequences of alcohol misuse are serious—in many cases, life threatening. Heavy drinking can increase the risk for certain cancers, especially those of the liver, esophagus, throat, and larynx (voice box). Heavy drinking can also cause liver cirrhosis, immune system problems, brain damage, and harm to the fetus during pregnancy. In addition, drinking increases the risk of death from automobile crashes as well as recreational and on-the-job injuries. Furthermore, both homicides and suicides are more likely to be committed by persons who have been drinking. In purely economic terms, alcohol-related problems cost society approximately $185 billion per year. In human terms, the costs cannot be calculated.

**What Is Alcoholism?**

Alcoholism, also known as “alcohol dependence,” is a disease that includes four symptoms:

- **Craving:** A strong need, or compulsion, to drink.
- **Loss of control:** The inability to limit one’s drinking on any given occasion.
- **Physical dependence:** Withdrawal symptoms, such as nausea, sweating, shakiness, and anxiety, occur when alcohol use is stopped after a period of heavy drinking.
- **Tolerance:** The need to drink greater amounts of alcohol in order to “get high.”

People who are not alcoholic sometimes do not understand why an alcoholic can’t just “use a little willpower” to stop drinking. However, alcoholism has little to do with willpower. Alcoholics are in the grip of a powerful “craving,” or uncontrollable need, for alcohol that overrides their ability to stop drinking. This need can be as strong as the need for food or water.
Although some people are able to recover from alcoholism without help, the majority of alcoholics need assistance. With treatment and support, many individuals are able to stop drinking and rebuild their lives.

Many people wonder why some individuals can use alcohol without problems but others cannot. One important reason has to do with genetics. Scientists have found that having an alcoholic family member makes it more likely that if you choose to drink you too may develop alcoholism. Genes, however, are not the whole story. In fact, scientists now believe that certain factors in a person’s environment influence whether a person with a genetic risk for alcoholism ever develops the disease. A person’s risk for developing alcoholism can increase based on the person’s environment, including where and how he or she lives; family, friends, and culture; peer pressure; and even how easy it is to get alcohol.

**What Is Alcohol Abuse?**

Alcohol abuse differs from alcoholism in that it does not include an extremely strong craving for alcohol, loss of control over drinking, or physical dependence. Alcohol abuse is defined as a pattern of drinking that results in one or more of the following situations within a 12-month period:

- Failure to fulfill major work, school, or home responsibilities;

- Drinking in situations that are physically dangerous, such as while driving a car or operating machinery;

- Having recurring alcohol-related legal problems, such as being arrested for driving under the influence of alcohol or for physically hurting someone while drunk; and

- Continued drinking despite having ongoing relationship problems that are caused or worsened by the drinking.
Although alcohol abuse is basically different from alcoholism, many effects of alcohol abuse are also experienced by alcoholics.

**What Are the Signs of a Problem?**

How can you tell whether you may have a drinking problem? Answering the following four questions can help you find out:

- Have you ever felt you should cut down on your drinking?
- Have people annoyed you by criticizing your drinking?
- Have you ever felt bad or guilty about your drinking?
- Have you ever had a drink first thing in the morning (as an “eye opener”) to steady your nerves or get rid of a hangover?

One “yes” answer suggests a possible alcohol problem. If you answered “yes” to more than one question, it is highly likely that a problem exists. In either case, it is important that you see your doctor or other health care provider right away to discuss your answers to these questions. He or she can help you determine whether you have a drinking problem and, if so, recommend the best course of action.

Even if you answered “no” to all of the above questions, if you encounter drinking-related problems with your job, relationships, health, or the law, you should seek professional help. The effects of alcohol abuse can be extremely serious—even fatal—both to you and to others.

**The Decision To Get Help**

Accepting the fact that help is needed for an alcohol problem may not be easy. But keep in mind that the sooner you get help, the better are your chances for a successful recovery.

Any concerns you may have about discussing drinking-related problems with your health care provider may stem from common misconceptions about alcoholism and alcoholic people. In our society, the myth prevails that an alcohol problem is a sign of moral weakness. As a result, you may feel that to seek help is to admit some type of shameful defect in yourself. In fact, alcoholism is a disease that is no more a sign of weakness than is asthma. Moreover, taking steps to identify a possible drinking problem has an enormous payoff—a chance for a healthier, more rewarding life.

When you visit your health care provider, he or she will ask you a number of questions about your alcohol use to determine whether you are having problems related to your drinking. Try to answer these questions as fully and honestly as you can. You also will be
given a physical examination. If your health care provider concludes that you may be dependent on alcohol, he or she may recommend that you see a specialist in treating alcoholism. You should be involved in any referral decisions and have all treatment choices explained to you.

Getting Well

Alcoholism Treatment

The type of treatment you receive depends on the severity of your alcoholism and the resources that are available in your community. Treatment may include detoxification (the process of safely getting alcohol out of your system); taking doctor-prescribed medications, such as disulfiram (Antabuse<sup>®</sup>) or naltrexone (ReVia™), to help prevent a return (or relapse) to drinking once drinking has stopped; and individual and/or group counseling. There are promising types of counseling that teach alcoholics to identify situations and feelings that trigger the urge to drink and to find new ways to cope that do not include alcohol use. These treatments are often provided on an outpatient basis.

Because the support of family members is important to the recovery process, many programs also offer brief marital counseling and family therapy as part of the treatment process. Programs may also link individuals with vital community resources, such as legal assistance, job training, childcare, and parenting classes.

Alcoholics Anonymous

Virtually all alcoholism treatment programs also include Alcoholics Anonymous (AA) meetings. AA describes itself as a “worldwide fellowship of men and women who help each other to stay sober.” Although AA is generally recognized as an effective mutual help program for recovering alcoholics, not everyone responds to AA’s style or message, and other recovery approaches are available. Even people who are helped by AA usually find that AA works best in combination with other forms of treatment, including counseling and medical care.
Can Alcoholism Be Cured?

Although alcoholism can be treated, a cure is not yet available. In other words, even if an alcoholic has been sober for a long time and has regained health, he or she remains susceptible to relapse and must continue to avoid all alcoholic beverages. “Cutting down” on drinking doesn’t work; cutting out alcohol is necessary for a successful recovery.

However, even individuals who are determined to stay sober may suffer one or several “slips,” or relapses, before achieving long-term sobriety. Relapses are very common and do not mean that a person has failed or cannot recover from alcoholism. Keep in mind, too, that every day that a recovering alcoholic has stayed sober prior to a relapse is extremely valuable time, both to the individual and to his or her family. If a relapse occurs, it is very important to try to stop drinking once again and to get whatever additional support you need to abstain from drinking.

Help for Alcohol Abuse

If your health care provider determines that you are not alcohol dependent but are nonetheless involved in a pattern of alcohol abuse, he or she can help you to:

• Examine the benefits of stopping an unhealthy drinking pattern.

• Set a drinking goal for yourself. Some people choose to abstain from alcohol. Others prefer to limit the amount they drink.

• Examine the situations that trigger your unhealthy drinking patterns, and develop new ways of handling those situations so that you can maintain your drinking goal.

Some individuals who have stopped drinking after experiencing alcohol-related problems choose to attend AA meetings for information and support, even though they have not been diagnosed as alcoholic.

New Directions

With NIAAA’s support, scientists at medical centers and universities throughout the country are studying alcoholism. The goal of this research is to develop better ways of treating and preventing alcohol problems. Today, NIAAA funds approximately 90 percent of all alcoholism research in the United States. Some of the more exciting investigations focus on the causes, consequences, treatment, and prevention of alcoholism:

• Genetics: Alcoholism is a complex disease. Therefore, there are likely to be many genes involved in increasing a person’s risk for alcoholism. Scientists are searching for these genes, and have found areas on chromosomes where they are probably located. Powerful new techniques may permit researchers to identify and measure the specific
contribution of each gene to the complex behaviors associated with heavy drinking. This research will provide the basis for new medications to treat alcohol-related problems.

- **Treatment:** NIAAA-supported researchers have made considerable progress in evaluating commonly used therapies and in developing new types of therapies to treat alcohol-related problems. One large-scale study sponsored by NIAAA found that each of three commonly used behavioral treatments for alcohol abuse and alcoholism—motivation enhancement therapy, cognitive-behavioral therapy, and 12-step facilitation therapy—significantly reduced drinking in the year following treatment. This study also found that approximately one-third of the study participants who were followed up either were still abstinent or were drinking without serious problems 3 years after the study ended. Other therapies that have been evaluated and found effective in reducing alcohol problems include brief intervention for alcohol abusers (individuals who are not dependent on alcohol) and behavioral marital therapy for married alcohol-dependent individuals.

- **Medications development:** NIAAA has made developing medications to treat alcoholism a high priority. We believe that a range of new medications will be developed based on the results of genetic and neuroscience research. In fact, neuroscience research has already led to studies of one medication—naltrexone (ReVia™)—as an anti-craving medication. NIAAA-supported researchers found that this drug, in combination with behavioral therapy, was effective in treating alcoholism. Naltrexone, which targets the brain’s reward circuits, is the first medication approved to help maintain sobriety after detoxification from alcohol since the approval of disulfiram (Antabuse®) in 1949. The use of acamprosate, an anti-craving medication that is widely used in Europe, is based on neuroscience research. Researchers believe that acamprosate works on different brain circuits to ease the physical discomfort that occurs when an alcoholic stops drinking. Acamprosate should be approved for use in the United States in the near future, and other medications are being studied as well.

- **Combined medications/behavioral therapies:** NIAAA-supported researchers have found that available medications work best with behavioral therapy. Thus, NIAAA has initiated a large-scale clinical trial to determine which of the currently available
medications and which behavioral therapies work best together. Naltrexone and acamprosate will each be tested separately with different behavioral therapies. These medications will also be used together to determine if there is some interaction between the two that makes the combination more effective than the use of either one alone.

In addition to these efforts, NIAAA is sponsoring promising research in other vital areas, such as fetal alcohol syndrome, alcohol’s effects on the brain and other organs, aspects of drinkers’ environments that may contribute to alcohol abuse and alcoholism, strategies to reduce alcohol-related problems, and new treatment techniques. Together, these investigations will help prevent alcohol problems; identify alcohol abuse and alcoholism at earlier stages; and make available new, more effective treatment approaches for individuals and families.

Resources

For more information on alcohol abuse and alcoholism, contact the following organizations:

**Al-Anon Family Group Headquarters, Inc.**

1600 Corporate Landing Parkway  
Virginia Beach, VA 23454–5617  
Phone: (757) 563–1600; Fax: (757) 563–1655  
Email: WSO@al-anon.org  
Internet address: http://www.al-anon.alateen.org

Makes referrals to local Al-Anon groups, which are support groups for spouses and other significant adults in an alcoholic person’s life. Also makes referrals to Alateen groups, which offer support to children of alcoholics. Free informational materials and locations of Al-Anon or Alateen meetings worldwide can be obtained by calling the toll-free number (888) 425–2666 from the United States or Canada, Monday through Friday, 8 a.m.–6 p.m. (e.s.t.).
Alcoholics Anonymous (AA) World Services, Inc.
475 Riverside Drive, 11th Floor
New York, NY 10115
Phone: (212) 870–3400; Fax: (212) 870–3003
Email: via AA’s Web site
Internet address: http://www.aa.org

Makes referrals to local AA groups and provides informational materials on the AA program. Many cities and towns also have a local AA office listed in the telephone book. All communication should be directed to AA’s mailing address: AA World Services, Inc., Grand Central Station, P.O. Box 459, New York, NY 10163.

National Council on Alcoholism and Drug Dependence, Inc. (NCADD)
20 Exchange Place, Suite 2902
New York, NY 10005
Phone: (212) 269–7797; Fax: (212) 269–7510
Email: national@ncadd.org
HOPE LINE: (800) NCA–CALL (24-hour Affiliate referral)
Internet address: http://www.ncadd.org

Offers educational materials and information on alcoholism. Provides phone numbers of local NCADD Affiliates (who can provide information on local treatment resources) via the above toll-free, 24-hour HOPE LINE.

National Institute on Alcohol Abuse and Alcoholism (NIAAA)
5635 Fishers Lane, MSC 9304
Bethesda, MD 20892-9304
Phone: (301) 443–3860; Fax: (301) 480–1726
Email: niaaaweb-r@exchange.nih.gov
Internet address: http://www.niaaa.nih.gov

Makes available free informational materials on all aspects of alcoholism, including the effects of drinking during pregnancy, alcohol use and the elderly, and help for cutting down on drinking.