Alcohol and the Brain

New breakthroughs in understanding society's most common addiction
Your brain on
A new understanding of how alcohol alters brain chemistry may transform treatment of the disease

BY SUSAN BRINK

Ask any alcoholic trying to take it just one day at a time, and he'll tell you that compulsive drinking is a disease—period. That's what the Big Book said, after all, the groundbreaking tome by Alcoholics Anonymous that came out way back in 1939. And that's what just about everyone has believed ever since.

But hold on. Technology, not for the first time, is forcing doctors and therapists to see things in a new light. With the aid of sophisticated new imaging techniques, scientists can look inside the brains of alcoholics at the very moment they're being tempted by thoughts of cold beers, crisp martinis, or fully ripened cabernet frances. The new science shows just how alcohol can rewire the circuitry of the brain, eroding its ability to feel pleasure and act wisely, and replacing it with a locus for intense craving and destructive behavior. "Alcoholism is a disease that interferes with home life, work, interpersonal relationships, and eventually with health," says James West, medical director emeritus of the Betty Ford Center in Rancho Mirage, Calif. "It's biological, but it's also psychosocial."

The picture is a scary one. But the good news is that it's changing the way doctors and specialists are thinking
about the treatment of alcoholism. Until recently, largely believing they had nothing to offer, physicians have left such treatment to counselors, recovering drinkers, and clergy. The result has been a hodgepodge of therapies, some with good results, others merely good intentions.

Now doctors are weighing in—big time. The most promising area of research is the new drugs that target specific areas of the brain to help ease the craving for liquor. One such drug—the first of its kind—has shown promise in quelling the terrible yen for a drink. Naltrexone has been approved by the Food and Drug Administration and is available by prescription. Two more drugs that also may ease craving are being tested in clinical trials.

But even proponents of pharmaceutical treatment say drugs aren’t the whole answer. Most alcoholics will still need counseling or 12-step programs to help confront the harm they may have caused or the growing up they need to do. Yet just as Prozac got general practitioners interested in depression, anticraving drugs might get more physicians involved in alcoholism treatment. Says Keith Humphreys, a psychologist and addiction researcher at Stanford University: "Doctors want to be able to do something medically."

Brain pain. The new brain-imaging technology will be the key to determining how much, and how effectively, doctors can help. Some 14 million people in the United States are alcoholics or abuse alcohol. They are skid-row bums and lace-curtain drunks, senseless rebels and charming rogues. They chill Louis Roederer Cristal champagne in silver buckets and swill Budweiser from plastic cups. They tell themselves they are not alcoholics because they never drink before 5 p.m., or because they make it to work every day, or because dinner is always on the table on time.

But their excuses can’t overcome the damage they do. Inga fell down a flight of stairs with her infant in her arms. Mark had five wives, and five divorces. Betty polished off a pint of vodka, then car-pooled fourth graders from soccer practice. Jeffrey committed strong-armed robbery. April, once shy, took off her clothes and danced for money. Martha threatened her husband with a carving knife. Paula slipped into the kitchen during dinner parties to swill down the last drops of wine left in dirty goblets. All are recovering alcoholics and they are ashamed of these recollections.

For active alcoholics, drinking trumps reason. It distorts judgment. It severs the connection between behavior and consequence. It lays waste to marriages, friendships, and careers. It leaves children stranded. For alcoholics, love and logic
can't hold a candle to liquor.

And the damage is not limited to others. Over time, addiction becomes an ener-
vating trial for the drinker. "I would al-
ways drink out of glasses that were opaque so my husband couldn't tell what I was drinking," says Jackie Clarke, sober for 16
years. "I would put vodka in my wine be-
cause wine seemed more acceptable. I was always thinking about what I was going to
to drink, when I was going to drink, hiding
to bottles so my husband wouldn't know how
much I drank. It was exhausting."

Just where alcohol abuse crosses the
line into addiction remains blurry. John
Schwarzlose, president of the Betty Ford
Center, has his own simple criterion: An
alcoholic abuser might get stopped once
while driving under the influence, and the experience
will be mortifying—and sobbing. For
an alcoholic, however, the embarrass-
ment is not enough. "Two or more DUs—that is
an alcoholic," says Schwarzlose. But it
is often a meaningless distinction to family members,
loved ones, and employers. They know
that excessive drinking can ruin lives
through betrayal, broken promises,
lost jobs, car accidents, and a host of other
personal tragedies.

Pure pleasure. Alcoholism is a disease
that can start with a first drink. With that
drink, one fork in the road appears, lead-
ing some to a future of alcoholism and others
to a lifetime of enjoyable, moderate
drinking. The brains of people genetically
predisposed to alcoholism may be un-
able to naturally produce adequate
dopamine—one of the brain chemicals
that make us feel pleasure. For them, the
first drink is a hit of dopamine, and of
pleasure, they haven't felt as strongly be-
fore. And then, it's love at first tipple. "The
first time I got drunk, I was 11 years old," says Clarke, of Falls Church, Va. "I was
babysitting with a girlfriend. We broke
into her father's liquor cabinet, and then
we had a food fight. I never had so much
fun in my life."

Only 1 in 9 people who drink continues
the path to alcoholism. Those who do suc-
cumb are disproportionately related to al-
cohohics; an estimated 50 percent to 60
percent of those who become alcoholics
have a genetic predisposition. "My father
was an alcoholic," says Mark Abel, 50, in
treatment for alcoholism at Operation Par
Village in Largo, Fla. "He worked hard and
he drank hard." But environment plays a
significant role, too. "When I was a kid, I
used to get my dad beers," recalls Abel. "I'd
get the first couple of sips on the way back
from the refrigerator. I loved the taste."

That's because alcohol heads to the
mind's seat of emotion and pleasure,
called the nucleus accumbens, which also
houses gratification of hunger, thirst, and
sex. There, like other addictive drugs, it in-
creases the concentration of dopamine,
a pleasure-causing chemical, in the brain's
reward circuits. But recent research shows
that alcohol also opens the floodgates on
other feel-good chemicals, including sero-
tonin. It disturbs levels of glutamate,
which can make people feel high, and then

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**Barbara Halsey**

Sober for almost a year, she plays with
son Billy. 5. "I found myself losing jobs,
too hung over to go in."

It interferes with other chemicals that can
make people feel tired. Enoch Gordis, di-
ger of the National Institute on Alcohol
Abuse and Alcoholism, calls alcohol "the
most widespread and damaging substance
we have in society."

Once excessive drinking begins, the new
research shows, alcohol begins reprofiling
the brain regardless of family histo-
ry. "In even nonsusceptible individuals,
chronic use may create addiction," says
psychiatrist Raymond Anton, scientific di-
ger of the Charleston Alcohol Research
Center at the Medical University of South
Carolina. People who binge several times
a week—five or more drinks in a day for
a man, four or more for a woman, ac-
cording to the National Institute on Alco-
hol Abuse and Alcoholism—are clearly at
risk, and they can also suffer other con-
sequences like impaired concentration,
slowed reflexes, disrupted sleep, and high

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blood pressure. There’s no evidence, however, that moderate drinking—two drinks a day for men, one drink for women—alters brain chemistry.

Want becomes need. People often start down the road to alcoholism in their teens or 20s. But stress later in life—a divorce in their 30s, a job loss in the 40s, the death of a loved one anytime—can also push a life off course. At this point, the amygdala, the part of the brain that helps the body respond to stress, may be calmed by alcohol. But though these drinkers may start later in life, heavy drinking likely causes similar brain alterations. Barbara Halsey, 47, didn’t begin to drink heavily until she divorced in her early 30s. At first, it was for the relief and fun of partying. Pretty soon, she was drinking almost every night. “I'd stay out late. I found myself losing jobs,” she says. However it starts, heavy drinking eventually robs alcohol of its value as a brain treat. Want becomes need. The drinker needs ever more alcohol to provide the same high until, eventually, the high is gone. "There was a time in my life when chemicals did something for me. And then one magical day, they stopped," says Jay Ehrlich, who has been sober for 16 years. "And I spent an inordinate amount of time trying to cross back over and get it back."

At this point, recent brain-imaging studies show, the primitive nucleus accumbens, with its hunger for pleasure, may ultimately not be the main player. New pathways have been formed, adapted to function in alcohol's service. Now, researchers believe, the frontal cortex, the brain's executive branch responsible for decisions and memory, holds a mere memory of pleasure, as insistent as the original pleasure, and demands another drink. Alcohol may also put its stamp on areas of the frontal cortex involved in judgment and impulse control.

From the frontal cortex, it’s a short hop to the basal ganglia, the brain center that when wired differently makes obsessive-compulsive people continually wash their hands or avoid stepping on cracks. The latest results from laboratory-animal studies suggest that alcoholism may use the same neural pathways that lead to compulsive behaviors. The brain then demands more and more alcohol, regardless of reason and consequences. "In the end, I'd drink by myself. I'd hide beer in the closets, under the porch of the house. It wasn’t fun anymore. It went from a luxury to a must," says Michael Small, 40, of Zephyrhills, Fla., who drank for more than 30 years.

**TEEN TIPPLERS**

**When being first isn’t best**

Nicole is blonde and ponytailed, the fatherless child of a Tampa waitress who struggles with addictions to drugs and alcohol. The eighth grader, who chose to be called Nicole for the sake of anonymity, has already been handed a lot to overcome, including her own alcoholism. "When I was about 10, I got pretty drunk," she says. But before she got sick from the beer she had sneaked from her mother’s refrigerator, she felt a little slice of heaven, a respite from a chaotic household. "It felt warm and cozy and comfortable," she says.

Three years later, at 13, she’s in alcohol treatment in a juvenile center. In the years she drank, she pilfered alcohol at home, stole money from her mother to buy liquor, ran away more than once, and felt popular with older boys. She was going downhill in school and was in danger of launching herself into a tragic life.

Nicole’s story is the classic parental nightmare. There are plenty of reasons to worry: Alcohol and young drivers are a deadly combination, and there’s the possibility of damage to young brains. Recent studies have shown that the sooner kids begin drinking, the greater the chance they will develop alcoholism. Among adolescents, 4 percent to 10 percent are full-blow alcoholics.

Watch out. Teenage experimentation with liquor doesn’t inevitably lead to later drinking problems, but parents should watch for warning signs, such as a new set of friends whom the child never brings home. “Adolescents who use hang with other users so they can keep that code of secrecy,” says Deborah Deas, director of the adolescent substance abuse program at the Medical University of South Carolina. Other signals include being unusually argumentative, testy, or sad, or losing motiva-
tion in school, even if grades remain good.

Children like Nicole have the deck stacked against them. Nicole has never met her father, and her mother is an alcoholic in treatment as a condition of retaining custody. Children of alcoholics are from two to four times more likely to develop the disease. The genetic underpinnings of alcoholism are not well understood, but one contributor is the body’s inherited ability to make a liver enzyme that is good at metabolizing alcohol. A high enzyme level gives even young people the ability to drink their peers under the table.

Growing up in an alcoholic family seems to play a role apart from genes. Nicole was used to seeing her mother drink with roommates and friends. “A lot of kids from addicted families say that the first time they ever felt normal was when they drank,” says Jerry Moe, who runs prevention programs for at-risk children at the Betty Ford Center in Rancho Mirage, Calif.

Even in families without a legacy of alcoholism, starting to drink later seems to better the odds of avoiding addiction. By eighth grade, 52 percent of adolescents have consumed alcohol, according to a Robert Wood Johnson survey. A 1998 study in the Journal of Substance Abuse estimated that for each year a teen delayed drinking between ages 13 and 21, the likelihood of developing addiction decreased by 5 percent.

Experts say children in alcoholic families must realize that they are at an increased risk for the disease and figure out how to say no to drinking until adulthood. “They can say, ‘I’m allergic to it’ or ‘It makes people in my family sick,’” says Moe. And alcohol may be less of a lure if kids get involved in activities like music or sports.

Nicole is hoping to play on a soccer team when she goes home. She recognizes she has to find new ways to have fun. “I know what can happen, and I’m scared,” she says. “All the time, I think, I’m only 13 and I have to put away all that fun—the only fun I know how to have.” —S.B.
hibition. Sudden withdrawal of alcohol alters the balance in favor of excitation. Valium can help, but it, too, is addictive. Some nonaddictive anticonvulsants, like carbamazepine, divalproex, and gabapentin, can also ease the passage.

Withdrawal is the relatively easy part, generally lasting three days or less. Dealing with the ongoing verbal dual between the devil on one shoulder and the angel on the other is the hard part. The brain has been reprogrammed to compulsively want a drink, and hundreds of individual thoughts or actions can trigger the craving—a walk past the neighborhood tavern or even seeing a beer commercial.

Subconscious desires. Craving can haunt recovering alcoholics even in sleep. "I had a dream last night that my friend met me at the airport with a huge glass of champagne," says Monica, 40-ish, tall, slim, and regal, who is checking out after 28 days at the Betty Ford Center. Such dreams are an indication that craving never rests. "Dreams are drives that call out for satisfaction," says Brian Johnson, a Boston psychoanalyst who specializes in addiction treatment.

Mark George, along with Anton, at the Medical University of South Carolina has done some of the first brain imaging showing the power of the mere thought of a drink can have on a recovering alcoholic's brain. He put alcoholics and non-alcoholics inside an MRI, then showed them photographs of martinis, beer bottles, or glasses of wine. They were also shown pictures of soft drinks and coffee, and a third set of neutral images. In alcoholics, the frontal cortex lights up with desire at the alcohol images.

Drugs can help dampen that desire, although no one knows exactly how. An early drug called Antabuse, now little used, made patients sick when they took a drink but didn't kill the craving. Naltrexone appears to. Originally used to counteract opiates like heroin, it might work by blocking a pleasurable surge of natural opiates released in the brain by an image or thought of alcohol. The drug may have worked for Scott Campagna, 23, of Atlanta, who participated in an ongoing trial. Campagna says he binges about twice a week—seven or eight beers and two or three hard drinks. "I feel I could quit or cut back if I wanted to," he says. He believes he got the drug, not a placebo, because he thought less about drinking the week he took it.

Another substance, acamprosate, has shown promising results in Europe. And ondansetron was found to reduce drinking and increase days of abstinence in clinical trials. Yet for now, alcoholism treatment centers are reluctant to prescribe drugs. At the Betty Ford Center, for ex-

### BEYOND EXCUSES
### How to help an alcoholic

The old wisdom held that alcoholics must hit bottom and find their own way back. And, indeed, treatment odds improve the more the drinker wants to change. But there are steps that friends, family members, and doctors can take to convince an alcoholic that it's time to get help:

- Stop making excuses and getting the drinker out of jams—a broken social engagement, a suspended driver's license. When an alcoholic experiences these consequences, he or she may be motivated to stop.
- Talk about your concerns during what may be rare moments of calm sobriety.
- And provide details of recent personal disappointments and calamities.
- Put your foot down—but only if you're certain you will follow through on your threats, such as moving out of the house.
- Ask a trusted friend to reinforce your concerns with the drinker.
- Get advice about how to stage an intervention in which friends, family, and a therapist confront the alcoholic. Up to 80 percent confronted in this way agree to get help.
- Enlist the help of a family doctor. Studies have shown that even brief discussions with physicians can persuade alcohol abusers to moderate their drinking or seek treatment.
- Gather information on treatment programs so that you're ready with a plan when the drinker is willing to get help. —S.B.
JAY EHRLICH
Getting high on the pleasure of a kiss. "Chemicals did something for me. And then one magical day, they stopped."

ters, such as Betty Ford, have success rates of more than 60 percent.) Other chronic diseases, such as diabetes and asthma, have similar relapse rates after medical treatment, according to a study published last fall in the Journal of the American Medical Association. A setback isn't cause to give up. "There is no, I repeat no, treatment [for alcoholism] that is finished at the end of a residential stay," says A. Thomas McLellan, author of the JAMA study. "There aren't cures here."

Treatment experts say patients and families should be skeptical of programs that promise much higher success rates—say 80 percent or more. Experts also caution against programs that forbid drugs of any sort, even such nonaddictive medications as some antidepressants, which can help some alcoholics.

No matter how much scientists learn about the brain changes behind alcoholism, much of the work of recovery still will fail to patients. And so will the rewards. "When I was drinking, my life was a roller coaster, and when I was sober, I thought sobriety would be a dull, flat line," says Clarke. Yet since she stopped drinking, she has lived in Hawaii for a year, traveled to sunny climes with friends, and painted desert scenes in California and cherry blossoms in Virginia. "Now, instead of just daydreaming, drunk on the couch, about wonderful things I would do, I do wonderful things." ♦

U.S. News spoke to dozens of alcoholics. Some agreed to be fully identified, others by their first names only. For those who requested confidentiality, fictional names are used.

WHERE TO LEARN MORE

- Treatment. For a list of programs as well as a discussion of approaches, visit the American Society of Addiction Medicine at www.asam.org.
- Support. Find a comprehensive listing of support groups for alcoholics and their families at mentalhelp.net/selfhelp.
- AA. Track down a nearby meeting at www.alcoholics-anonymous.org.
- Questions. For answers to questions such as how to tell if you are an alcoholic, see www.niaaa.nih.gov.

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