ALAN I. LESHNER

Addiction Is a Brain Disease

Greater progress will be made against drug abuse when our strategies reflect the full complexities of the latest scientific understanding.

The United States is stuck in its drug abuse metaphors and in polarized arguments about them. Everyone has an opinion. One side insists that we must control supply, the other that we must reduce demand. People see addiction as either a disease or as a failure of will. None of this bumpersticker analysis moves us forward. The truth is that we will make progress in dealing with drug issues only when our national discourse and our strategies are as complex and comprehensive as the problem itself.

A core concept that has been evolving with scientific advances over the past decade is that drug addiction is a brain disease that develops over time as a result of the initially voluntary behavior of using drugs. The consequence is virtually uncontrollable compulsive drug craving, seeking, and use that interferes with, if not destroys, an individual's functioning in the family and in society. This medical condition demands formal treatment.

We now know in great detail the brain mechanisms through which drugs acutely modify mood, memory, perception, and emotional states. Using drugs repeatedly over time changes brain structure and function in fundamental and long-lasting ways that can persist long after the individual stops using them. Addiction comes about through an array of neuroadaptive changes and the laying down and strengthening of new memory connections in various circuits in the brain. We do not yet know all the relevant mechanisms, but the evidence suggests that those long-lasting brain changes are responsible for the distortions of cognitive and emotional functioning that characterize addicts, particularly including the compulsion to use drugs that is the essence of addiction. It is as if drugs have highjacked the brain's natural motivational control circuits, resulting in drug use becoming the sole, or at least the top, motivational priority for the individual. Thus, the majority of the biomedical community now considers addiction, in its essence, to be a brain disease: a condition caused by persistent changes in brain structure and function.

This brain-based view of addiction has generated substantial controversy, particularly among people who seem able to think only in polarized ways. Many people erroneously still believe that biologi-

Alan I. Leshner is director of the National Institute on Drug Abuse at the National Institutes of Health.

cal and behavioral explanations are alternative or competing ways to understand phenomena, when in fact they are complementary and integratable. Modern science has taught that it is much too simplistic to set biology in opposition to behavior or to pit willpower against brain chemistry. Addiction involves inseparable biological and behavioral components. It is the quintessential biobehavioral disorder.

Many people also erroneously still believe that drug addiction is simply a failure of will or of strength of character. Research contradicts that position. However, the recognition that addiction is a brain disease does not mean that the addict is simply a hapless victim. Addiction begins with the voluntary behavior of using drugs, and addicts must participate in and take some significant responsibility for their recovery. Thus, having this brain disease does not absolve the addict of responsibility for his or her behavior, but it does explain why an addict cannot simply stop using drugs by sheer force of will alone. It also dictates a much more sophisticated approach to dealing with the array of problems surrounding drug abuse and addiction in our society.

The essence of addiction

The entire concept of addiction has suffered greatly from imprecision and misconception. In fact, if it were possible, it would be best to start all over with some new, more neutral term. The confusion comes about in part because of a now archaic distinction between whether specific drugs are "physically" or "psychologically" addicting. The distinction historically revolved around whether or not dramatic physical withdrawal symptoms occur when an individual stops taking a drug; what we in the field now call "physical dependence."

However, 20 years of scientific research has taught that focusing on this physical versus psychological distinction is off the mark and a distraction from the real issues. From both clinical and policy perspectives, it actually does not matter very much what physical withdrawal symptoms occur. Physical dependence is not that important, because even the dramatic withdrawal symptoms of heroin and alcohol addiction can now be easily managed with appropriate medications. Even more important, many of the most dangerous and addicting drugs, including methamphetamine and crack cocaine, do not produce very severe physical dependence symptoms upon withdrawal.

What really matters most is whether or not a drug causes what we now know to be the essence of addiction: uncontrollable, compulsive drug craving, seeking, and use, even in the face of negative health and social consequences. This is the crux of how the Institute of Medicine, the American Psychiatric Association, and the American Medical Association define addiction and how we all should use the term. It is really only this compulsive quality of addiction that matters in the long run to the addict and to his or her family and that should matter to society as a whole. Compulsive craving that overwhelms all other motivations is the root cause of the massive health and social problems associated with drug addiction. In updating our national discourse on drug abuse, we should keep in mind this simple definition: Addiction is a brain disease expressed in the form of compulsive behavior. Both developing and recovering from it depend on biology, behavior, and social context.

It is also important to correct the common misimpression that drug use, abuse, and addiction are points on a single continuum along which one slides back and forth over time, moving from user to addict, then back to occasional user, then back to addict. Clinical observation and more formal research studies support the view that, once addicted, the individual has moved into a different state of being. It is as if a threshold has been crossed. Very few people appear able to successfully return to occasional use after having been truly addicted. Unfortunately, we do not yet have a clear biological or behavioral marker of that transition from voluntary drug use to addiction. However, a body of scientific evidence is rapidly developing that points to an array of cellular and molecular changes in specific brain circuits. Moreover, many of these brain changes are common to all chemical addictions, and some also are typical of other compulsive behaviors such as pathological overeating.

Addiction should be understood as a chronic recurring illness. Although some addicts do gain full control over their drug use after a single treatment episode, many have relapses. Repeated treatments become necessary to increase the intervals between and diminish the intensity of relapses, until the individual achieves abstinence.

The complexity of this brain disease is not atypical, because virtually no brain diseases are simply biological in nature and expression. All, including stroke, Alzheimer's disease, schizophrenia, and clinical depression, include some behavioral and social aspects. What may make addiction seem unique among brain diseases, however, is that it does begin with a clearly voluntary behavior—the initial decision to use drugs. Moreover, not everyone who ever uses drugs goes on to become addicted. Individuals differ substantially in how easily and quickly they become addicted and in their preferences for particular substances. Consistent with the biobehavioral nature of addiction, these individual differences result from a combination of environmental and biological, particularly genetic, factors. In fact, estimates are that between 50 and 70 percent of the variability in susceptibility to becoming addicted can be accounted for by genetic factors.

Although genetic characteristics may predispose individuals to be more or less susceptible to becoming addicted, genes do not doom one to become an addict.

Over time the addict loses substantial control over his or her initially voluntary behavior, and it becomes compulsive. For many people these behaviors are truly uncontrollable, just like the behavioral expression of any other brain disease. Schizophrenics cannot control their hallucinations and delusions. Parkinson's patients cannot control their trembling. Clinically depressed patients cannot voluntarily control their moods. Thus, once one is addicted, the characteristics of the illness—and the treatment approaches—are not that different from most other brain diseases. No matter how one develops an illness, once one has it, one is in the diseased state and needs treatment.

Moreover, voluntary behavior patterns are, of course, involved in the etiology and progression of many other illnesses, albeit not all brain diseases. Examples abound, including hypertension, arteriosclerosis and other cardiovascular diseases, diabetes, and forms of cancer in which the onset is heavily influenced by the individual's eating, exercise, smoking, and other behaviors.

Addictive behaviors do have special characteristics related to the social contexts in which they originate. All of the environmental cues surrounding initial drug use and development of the addiction actually become "conditioned" to that drug use and are thus critical to the development and expression of addiction. Environmental cues are paired in time with an individual's initial drug use experiences and, through classical conditioning, take on conditioned stimulus properties. When those cues are present at a later time, they elicit anticipation of a drug experience and thus generate tremendous drug craving. Cue-induced craving is one of the most frequent causes of drug use relapses, even after long periods of abstinence, independently of whether drugs are available.

The salience of environmental or contextual cues helps explain why reentry to one's community can be so difficult for addicts leaving the controlled environments of treatment or correctional settings and why aftercare is so essential to successful recovery. The person who became addicted in the home environment is constantly exposed to the cues conditioned to his or her initial drug use, such as the neighborhood where he or she hung out, drug-using buddies, or the lamppost where he or she bought drugs. Simple exposure to those cues automatically triggers craving and can lead rapidly to relapses. This is one reason why someone who apparently overcame drug cravings while in prison or residential treatment could quickly revert to drug use upon returning home. In fact, one of the major goals of drug addiction treatment is to teach addicts how to deal with the cravings caused by inevitable exposure to these conditioned cues.

Implications

Understanding addiction as a brain disease has broad and significant implications for the public perception of addicts and their families, for addiction treatment practice, and for some aspects of public policy. On the other hand, this biomedical view of addiction does not speak directly to and is unlikely to

bear significantly on many other issues, including specific strategies for controlling the supply of drugs and whether initial drug use should be legal or not. Moreover, the brain disease model of addiction does not address the question of whether specific drugs of abuse can also be potential medicines. Examples abound of drugs that can be both highly addicting and extremely effective medicines. The best-known example is the appropriate use of morphine as a treatment for pain. Nevertheless, a number of practical lessons can be drawn from the scientific understanding of addiction.

It is no wonder addicts cannot simply quit on their own. They have an illness that requires biomedical treatment. People often assume that because addiction begins with a voluntary behavior and is expressed in the form of excess behavior, people should just be able to quit by force of will alone. However, it is essential to understand when dealing with addicts that we are dealing with individuals whose brains have been altered by drug use. They need drug addiction treatment. We know that, contrary to common belief, very few addicts actually do just stop on their own. Observing that there are very few heroin addicts in their 50 or 60s, people frequently ask what happened to those who were heroin addicts 30 years ago, assuming that they must have quit on their own. However, longitudinal studies find that only a very small fraction actually quit on their own. The rest have either been successfully treated, are currently in maintenance treatment, or (for about half) are dead. Consider the example of smoking cigarettes: Various studies have found that between 3 and 7 percent of people who try to quit on their own each year actually succeed. Science has at last convinced the public that depression is not just a lot of sadness; that depressed individuals are in a different brain state and thus require treatment to get their symptoms under control. The same is true for schizophrenic patients. It is time to recognize that this is also the case for addicts.

The role of personal responsibility is undiminished but clarified. Does having a brain disease mean that people who are addicted no longer have any responsibility for their behavior or that they are simply victims of their own genetics and brain chemistry? Of course not. Addiction begins with the voluntary behavior of drug use, and although genetic characteristics may predispose individuals to be more or less susceptible to becoming addicted, genes do not doom one to become an addict. This is one major reason why efforts to prevent drug use are so vital to any comprehensive strategy to deal with the nation's drug problems. Initial drug use is a voluntary, and therefore preventable, behavior.

Moreover, as with any illness, behavior becomes a critical part of recovery. At a minimum, one must comply with the treatment regimen, which is harder than it sounds. Treatment compliance is the biggest cause of relapses for all chronic illnesses, including asthma, diabetes, hypertension, and addiction. Moreover, treatment compliance rates are no worse for addiction than for these other illnesses, ranging from 30 to 50 percent. Thus, for drug addiction as well as for other chronic diseases, the individual's motivation and behavior are clearly important parts of success in treatment and recovery.

Implications for treatment approaches and treatment expectations. Maintaining this comprehensive biobehavioral understanding of addiction also speaks to what needs to be provided in drug treatment programs. Again, we must be careful not to pit biology against behavior. The National Institute on Drug Abuse's recently published Principles of Effective Drug Addiction Treatment provides a detailed discussion of how we must treat all aspects of the individual, not just the biological component or the behavioral component. As with other brain diseases such as schizophrenia and depression, the data show that the best drug addiction treatment approaches attend to the entire individual, combining the use of medications, behavioral therapies, and attention to necessary social services and rehabilitation. These might include such services as family therapy to enable the patient to return to successful family life, mental health services, education and vocational training, and housing services.

That does not mean, of course, that all individuals need all components of treatment and all rehabilitation services. Another principle of effective addiction treatment is that the array of services included in an individual's treatment plan must be matched to his or her particular set of needs. Moreover, since those needs will surely change over the course of recovery, the array of services provided will need to be continually reassessed and adjusted.

What to do with addicted criminal offenders. One obvious conclusion is that we need to stop simplistically viewing criminal justice and health approaches as incompatible opposites. The practical reality is that crime and drug addiction often occur in tandem: Between 50 and 70 percent of arrestees are addicted to illegal drugs. Few citizens would be willing to relinquish criminal justice system control over individuals, whether they are addicted or not, who have committed crimes against others. Moreover, extensive real-life experience shows that if we simply incarcerate addicted offenders without treating them, their return to both drug use and criminality is virtually guaranteed.

Entry into drug treatment need not be completely voluntary in order for it to work.

A growing body of scientific evidence points to a much more rational and effective blended public health/public safety approach to dealing with the addicted offender. Simply summarized, the data show that if addicted offenders are provided with well-structured drug treatment while under criminal justice control, their recidivism rates can be reduced by 50 to 60 percent for subsequent drug use and by more than 40 percent for further criminal behavior. Moreover, entry into drug treatment need not be completely voluntary in order for it to work. In fact, studies suggest that increased pressure to stay in treatment—whether from the legal system or from family members or employers—actually increases the amount of time patients remain in treatment and improves their treatment outcomes.

Findings such as these are the underpinning of a very important trend in drug control strategies now being implemented in the United States and many foreign countries. For example, some 40 percent of prisons and jails in this country now claim to provide some form of drug treatment to their addicted inmates, although we do not know the quality of the treatment provided. Diversion to drug treatment programs as an alternative to incarceration is gaining popularity across the United States. The widely applauded growth in drug treatment courts over the past five years—to more than 400—is another successful example of the blending of public health and public safety approaches. These drug courts use a combination of criminal justice sanctions and drug use monitoring and treatment tools to manage addicted offenders.

Updating the discussion

Understanding drug abuse and addiction in all their complexity demands that we rise above simplistic polarized thinking about drug issues. Addiction is both a public health and a public safety issue, not one or the other. We must deal with both the supply and the demand issues with equal vigor. Drug abuse and addiction are about both biology and behavior. One can have a disease and not be a hapless victim of it.

We also need to abandon our attraction to simplistic metaphors that only distract us from developing appropriate strategies. I, for one, will be in some ways sorry to see the War on Drugs metaphor go away, but go away it must. At some level, the notion of waging war is as appropriate for the illness of addiction as it is for our War on Cancer, which simply means bringing all forces to bear on the problem in a focused and energized way. But, sadly, this concept has been badly distorted and misused over time, and the War on Drugs never became what it should have been: the War on Drug Abuse and Addiction. Moreover, worrying about whether we are winning or losing this war has deteriorated to using simplistic and inappropriate measures such as counting drug addicts. In the end, it has only fueled discord. The War on Drugs metaphor has done nothing to advance the real conceptual challenges that need to be worked through.

I hope, though, that we will all resist the temptation to replace it with another catchy phrase that inevitably will devolve into a search for quick or easy-seeming solutions to our drug problems. We do not rely on simple metaphors or strategies to deal with our other major national problems such as education, health care, or national security. We are, after all, trying to solve truly monumental, multidimensional problems on a national or even international scale. To devalue them to the level of slogans does our public an injustice and dooms us to failure.

Understanding the health aspects of addiction is in no way incompatible with the need to control the supply of drugs. In fact, a public health approach to

stemming an epidemic or spread of a disease always focuses comprehensively on the agent, the vector, and the host. In the case of drugs of abuse, the agent is the drug, the host is the abuser or addict, and the vector for transmitting the illness is clearly the drug suppliers and dealers that keep the agent flowing so readily. Prevention and treatment are the strategies to help protect the host. But just as we must deal with the flies and mosquitoes that spread infectious diseases, we must directly address all the vectors in the drug-supply system.

In order to be truly effective, the blended public health/public safety approaches advocated here must be implemented at all levels of society—local, state, and national. All drug problems are ultimately local in character and impact, since they differ so much across geographic settings and cultural contexts, and the most effective solutions are implemented at the local level. Each community must work through its own locally appropriate antidrug implementation strategies, and those strategies must be just as comprehensive and science-based as those instituted at the state or national level.

The message from the now very broad and deep array of scientific evidence is absolutely clear. If we as a society ever hope to make any real progress in dealing with our drug problems, we are going to have to rise above moral outrage that addicts have "done it to themselves" and develop strategies that are as sophisticated and as complex as the problem itself. Whether addicts are "victims" or not, once addicted they must be seen as "brain disease patients."

Moreover, although our national traditions do argue for compassion for those who are sick, no matter how they contracted their illnesses, I recognize that many addicts have disrupted not only their own lives but those of their families and their broader communities, and thus do not easily generate compassion. However, no matter how one may feel about addicts and their behavioral histories, an extensive body of scientific evidence shows that approaching addiction as a treatable illness is extremely cost-effective, both financially and in terms of broader societal impacts such as family violence, crime, and other forms of social upheaval. Thus, it is clearly in everyone's interest to get past the hurt and indignation and slow the drain of drugs on society by enhancing drug use prevention efforts and providing treatment to all who need it.

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