

## **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.

### **Recommended Reading**

J. D. Berke and S. E. Hyman, "Addiction, Dopamine, and the Molecular Mechanisms of Memory," *Neuron* 25 (2000): 515-532 (<http://www.neuron.org/cgi/content/full/25/3/515/>).

H. Garavan, J. Pankiewicz, A. Bloom, J. K. Cho, L. Sperry, T. J. Ross, B. J. Salmeron, R. Risinger, D. Kelley, and E. A. Stein, "Cue-Induced Cocaine Craving: Neuroanatomical Specificity for Drug Users and Drug Stimuli," *American Journal of Psychiatry* 157 (2000): 1789-1798 (<http://ajp.psychiatryonline.org/cgi/content/full/157/11/1789>).

A. I. Leshner, "Science-Based Views of Drug Addiction and Its Treatment," *Journal of the American Medical Association* 282 (1999): 1314-1316 (<http://jama.ama-assn.org/issues/v282n14/rfull/jct90020.html>).

A. T. McLellan, D. C. Lewis, C. P. O'Brien, and H. D. Kleber, "Drug Dependence, a Chronic Medical Illness," *Journal of the American Medical Association* 284 (2000): 1689-1695 (<http://jama.ama-assn.org/issues/v284n13/rfull/jsc00024.html>).

National Institute on Drug Abuse, Principles of Drug Addiction Treatment: A Research-Based Guide (National Institutes of Health, Bethesda, MD, July 2000) (<http://165.112.78.61/PODAT/PODATindex.html>).

National Institute on Drug Abuse, Preventing Drug Use Among Children and Adolescents: A Research-Based Guide (National Institutes of Health, Bethesda, MD, March 1997) (<http://165.112.78.61/Prevention/Prevopen.html>).

E. J. Nestler, "Genes and Addiction," *Nature Genetics* 26 (2000): 277-281 ([http://www.nature.com/cgi-taf/DynaPage.taf?file=/ng/journal/v26/n3/full/ng1100\\_277.html](http://www.nature.com/cgi-taf/DynaPage.taf?file=/ng/journal/v26/n3/full/ng1100_277.html)).

Physician Leadership on National Drug Policy, position paper on drug policy (PLNDP Program Office, Brown University, Center for Alcohol and Addiction Studies, Providence, R.I.: January 2000) (<http://center.butler.brown.edu/plndp/Resources/resources.html>).

F. S. Taxman and J. A. Bouffard, "The Importance of Systems in Improving Offender Outcomes: New Frontiers in Treatment Integrity," *Justice Research and Policy* 2 (2000): 37-58.

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