

Addiction is a Brain Disease

Although each drug that has been studied has some idiosyncratic mechanisms of action, virtually all drugs of abuse have common effects, either directly or indirectly, on a single pathway deep within the brain, the mesolimbic reward system. Activation of this system appears to be a common element in what keeps drug users taking drugs. This is not unique to any one drug; *all addictive substances affect this circuit.*

Not only does acute drug use modify brain function in critical ways, but prolonged drug use causes pervasive changes in brain function that persist long after the individual stops taking the drug. Significant effects of chronic use have been identified for many drugs at all levels: molecular, cellular, structural, and functional. The addicted brain is distinctly different from the nonaddicted brain, as manifested by changes in brain metabolic activity, receptor availability, gene expression, and responsiveness to environmental cues. Some of these long-lasting brain changes are idiosyncratic to specific drugs, whereas others are common to many different drugs. We can actually see these changes through use of recently developed technologies, such as positron emission tomography. The common brain effects of addicting substances suggest common brain mechanisms underlying all addictions.

Addiction is a Brain Disease (*contd.*)

That addiction is so clearly tied to changes in brain structure and function is what makes it, fundamentally, a brain disease. A metaphorical switch in the brain seems to be thrown following prolonged drug use. Initially, drug use is a voluntary behavior, but as that switch is thrown, the individual moves into the state of addiction, characterized by compulsive drug seeking and use. The state of addiction—both the clinical condition and the brain state—is qualitatively different from the effects of large amounts of drugs.

The individual, once addicted, has moved from a state where drug use is voluntary and controlled to one where drug craving, seeking, and use are no longer under the same kind of voluntary control, and these changes reflect changes in brain function.

Understanding that addiction is, at its core, a consequence of fundamental changes in brain function means that a major goal of treatment must be either to reverse or to compensate for those brain changes. This could be accomplished through either medications or behavioral treatments (behavioral treatments alter brain function in other psychobiological disorders). Understanding of the biology underlying the metaphorical switch is key to the development of more effective treatments, particularly antiaddiction medication.

Addiction is a chronic, relapsing disorder

Addiction is rarely an acute illness. For most people, it is a chronic, relapsing disorder. Total abstinence for the rest of one's life is a relatively rare outcome from a single treatment episode without continued support in 12-step groups. Relapses are more the norm. Thus, addiction must be approached more like other chronic illnesses-diabetes, chronic hypertension-than like an acute illness, such as a bacterial infection or a broken bone. This has tremendous implications for how we evaluate treatment effectiveness and treatment outcomes. Viewing addiction as a chronic, relapsing disorder means that a good treatment outcome - and the most reasonable expectation - is a significant decrease in drug use and long periods of abstinence, with only occasional relapses. Thus, a reasonable standard for treatment success is not curing the illness but managing it, as is the case for other chronic illnesses. However, our goal is to help our clients learn and embrace the tools necessary to live a life of recovery without relapse.

Addiction is not just a brain disease

Of course, addiction is not that simple. Addiction is not just a brain disease. It is a brain disease for which the social contexts in which it both has developed and is expressed are critically important. The case of the many thousands of returning Vietnam war veterans who were addicted to heroin illustrates this point clearly. In contrast to addicts on the streets of America, it was relatively easy to treat the returning veterans' addictions. This success was possible because they had become addicted while in an almost totally different setting from the one to which they returned. At home in the United States, they were exposed to very few of the conditioned environmental cues that had initially been associated with their drug use in Vietnam. Exposure to those conditioned cues can be a major factor in causing persistent or recurrent drug cravings and drug use relapses even after successful treatment.

The implications are obvious. If we understand addiction as a prototypical psychobiological illness, with critical biological, behavioral, and social context components, our treatment strategies must include biological, behavioral, and social context elements. Not only must the underlying brain disease be treated, but the behavioral and social cue components must also be addressed, just as they are with many other brain diseases, including stroke, schizophrenia, and Alzheimer's disease.

