Topics in Brief
National Institute on Drug Abuse

NIDA
NATIONAL INSTITUTE
ON DRUG ABUSE

Medications Development – November 2011

The Burden of Drug Abuse and Addiction

We have a public health mandate to stop the devastating scourge of drug abuse and addiction afflicting this country. Translating the knowledge we have gained into new medications could revolutionize the way we treat addiction and even how we prevent drug abuse from occurring in the first place. It is a gaping need.

- Addiction costs this country more than $600 billion annually in increased health care costs, crime, and lost productivity, not to mention the incalculable effects on individuals, families, and whole communities.
- Cigarettes continue to kill roughly 443,000 people, nearly 1 of every 5 deaths each year in this country[i]—yet the quest to discover treatments for nicotine addiction lags far behind the efforts to develop medications for the diseases it causes.
- Illicit drug use prompted 2.1 million drug-related emergency room visits in 2009,[ii] the same year an estimated 7.8 million Americans were in need of treatment for illicit drug abuse.

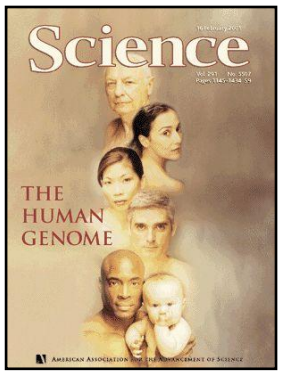
Despite many promising scientific leads, we still have no medications approved to treat stimulant, cannabis, inhalants, or polysubstance abuse, all of which can have catastrophic consequences.

The Need for Pharmaceutical Industry Involvement

NIDA is working hard to leverage research in partnership with private entities to help bring a medication to market, but it is an uphill battle. Many pharmaceutical companies shy away from medications development for illicit drug use disorders because of a perceived lack of economic incentive, the stigma still attached to illicit drug addiction, plus concerns about liability related to the overall health of individuals with substance use disorders. Yet we need private-sector involvement to harness the full clinical potential of scientific discovery.

- Bringing a new medication to market could cost up to $2 billion, according to recent estimates,[iii] twice NIDA's entire budget for one year.

Unfortunately, the pharmaceutical industry is reducing its investment in psychotherapeutics research and medications development,[iv] which not only reduces availability of medications for other mental illnesses, but contracts the pool of available medications for secondary uses, including the treatment of drug addiction.



The State of the Science: New Medications Possibilities for Drug Abuse

Accumulated knowledge and recent discoveries have revealed numerous molecules and circuits that could serve as the basis for new approaches to medications development. To achieve the goal of accelerating medications development, NIDA is focusing on the scientific opportunities in the following research areas.

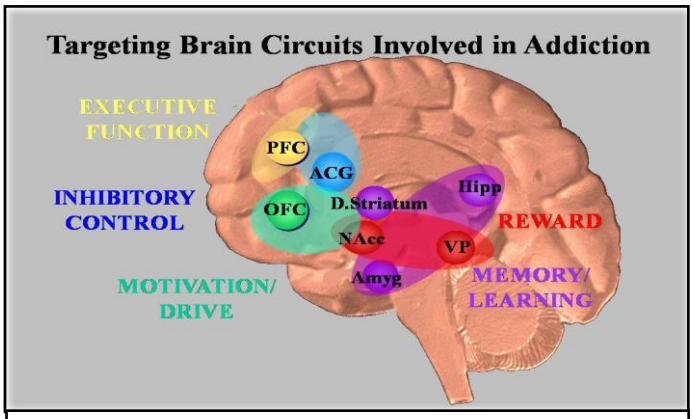
- *Genomics and epigenetics.* Our improved ability to identify gene variants and epigenetic events that correlate with or contribute to addiction vulnerability offers exciting opportunities for the development of medications to treat drug addiction. A compelling example is the discovery of a cluster of nicotinic acetylcholine

receptor genes on chromosome 15 linked to nicotine dependence, and specifically the identification of the α5 nicotinic receptor gene as a potential medication target. It was found to affect nicotine withdrawal, which often prompts relapse in tobacco users. Another novel strategy stems from epigenetic studies that delineate the chromatin marks involved in the transition from acute, controlled drug intake to compulsive administration, offering a completely new array of potential medication targets.

- *High resolution mapping of targeted brain areas.* Research advances in how drugs alter the brain circuits involved in reward, motivation, and self control (among others) have expanded the scope of pharmacological targets for interfering with the loss of control and the compulsive drive to consume drugs characteristic of addiction.

- *Anti-addiction vaccines.* Preclinical and clinical studies have revealed the feasibility and promise of vaccines as strategies for treating addiction. These vaccines work by inducing drug-specific antibodies that prevent the drug from entering the brain. Vaccines under study for nicotine and cocaine show considerable promise.

- *Medication combinations.* Combination therapies have emerged as a promising strategy for treating many diseases, such as HIV and cancer. Several medication combinations already show promise for treating addiction to cocaine and to marijuana, particularly the withdrawal symptoms that often lead to relapse in those trying to quit.



New knowledge about which parts of the brain are involved in drug abuse and addiction has revealed new targets for medications development. These medications aim to:

- interfere with a drug's reinforcing effects
- increase the value of natural rewards
- strengthen executive function/inhibitory control
- interfere with conditioning/create new memories
- counteract stress responses that lead to relapse

There Is Hope

Advances in science and policy should provide incentives for engaging pharmaceutical companies. Capitalizing on new approaches that target brain circuits and molecules common to multiple addictions, including alcohol and tobacco, can help increase market share for resulting medications. Also, implementation of the Affordable Care Act stands to expand access to substance abuse treatment and open up the market for addiction medications.

Having viable medications available to treat substance use disorders, so costly to our society, would help these conditions become recognized as medical disorders, reducing the associated stigma and facilitating the proper treatment of people suffering from the disease of addiction. Given the dearth of medications available for this purpose (including for nicotine addiction), support of medications development for drug abuse and addiction will have a major impact on public health and the overall economy.

For more information please visit NIDA on the web at www.drugabuse.gov or contact:

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[i] http://www.cdc.gov/tobacco/data_statistics/fact_sheets/health_effects/effects_cig_smoking/index.htm

[ii] Substance Abuse and Mental Health Services Administration (SAMHSA), Center for Applied Health Statistics and Quality (2010). The *DAWN* Report: Highlights of the 2009 Drug Abuse Warning Network (*DAWN*) Findings on Drug-Related Emergency Department Visits. Rockville, MD. Available at: http://oas.samhsa.gov/2k10/DAWN034/EDHighlights.htm

[iii] Adams CP and Brantner VV. Spending on new drug development. Health Economics 19:130-141, 2010;
—Estimating the cost of new drug development: Is it really 802 million? Health Affairs 25:420–28, 2006.
DiMasi JA, Hansen RW, Grabowski HG. The price of innovation: new estimates of drug development costs. Journal of Health Economics 22:151-185, 2003.

[iv] Associated Press, March 2, 2010: "AstraZeneca shuffles, eliminates Del. R&D jobs."
The Motley Fool, February 26, 2010: "Drug Company Cost Cuts: Careful What You Wish For" (http://www.fool.com/investing/general/2010/02/26/drug-company-cost-cuts-careful-what-you-wish-for.aspx).