

National Institutes of Health

Scientific Strategic Plan: New Opportunities in Substance Use, Abuse, and Addiction

Background

In November 2010, the Scientific Management Review Board (SMRB), established pursuant to Sec. 401(e) of the Public Health Service Act, issued a report stating that the current organization of substance use, abuse, and addiction-related research at the National Institutes of Health (NIH) is not optimal and that some form of reorganization is required to effectively capitalize upon existing and potential synergies, address scientific opportunities, meet public health needs, and train the next generation of investigators¹.

NIH subsequently formed a Scientific Strategic Planning Committee of experts from the potentially affected Institutes and Centers with the primary goal of identifying new scientific opportunities. In order to inform the deliberations, NIH published a Request for Information (RFI) that closed on May 11, 2012 soliciting input into the Scientific Strategic Plan, and received approximately 500 responses². A summary and analysis of the RFI is available online³. NIH also hosted a one-hour public web meeting on April 2, 2012, to discuss the RFI and the development of the Scientific Strategic Plan⁴, and held additional stakeholder meetings to gain input on new opportunities in research and public health. The new opportunities identified during this process and recommended by the Planning Committee are highlighted in the following section, while recognizing that the current substance use, abuse, and addiction research and public health priorities as described in the strategic plans of the National Institute on Alcohol Abuse and Alcoholism (NIAAA, <http://www.niaaa.nih.gov/about-niaaa/our-work/strategic-plan>) and the National Institute on Drug Abuse (NIDA, <http://www.drugabuse.gov/about-nida/2010-strategic-plan>) are vital areas of investigation that will continue to be important going forward.

Overview of New Opportunities

¹ http://smrb.od.nih.gov/documents/announcements/SUAA_112010.pdf

² All individual responses are available at: http://grants.nih.gov/grants/guide/rfi_files/nih_nisuad/web_listing.cfm

³ <http://feedback.nih.gov/index.php/suaa/rfi-analysis/>

⁴ The slides, audio file, and transcript from the web meeting are available at: http://feedback.nih.gov/index.php/suaa/webmeeting_slides/

Addiction is a multidimensional disease that is influenced by multiple risk and protective factors. Thus, an effective national research effort focused on substance use, abuse, and addiction must operate across all levels (i.e., from molecules to society) to ensure the development of a comprehensive understanding of addiction, its precursors, and its consequences. This knowledge base advances the rapid and broad translation of interventions for prevention and treatment.

NIH already has significant commitments in substance use, abuse, and addiction research, most of which are currently housed in NIAAA and NIDA, but there are also critical areas of investigation in the National Cancer Institute and other Institutes and Centers. Taking into consideration the current investments and priorities in substance abuse and addiction research, this document highlights *new* synergies and opportunities that are not sufficiently addressed across NIH at this time. At the same time, research training will also need to be broadened to ensure a cadre of scientists prepared to exploit these new opportunities related to substance abuse and other addictive behavioral disorders.

Basic Sciences

- Better understand the developing brain, from fetal development through adulthood, including how genetic and environmental exposures (e.g., drugs and alcohol and their combination) affect function with respect to substance abuse risk.
- Examine the brain remodeling associated with substance abuse/dependence, including the neurobiology (neuroplasticity) of brain resilience and recovery, such as the process by and extent to which the brain can heal, within the context of long-term recovery and the potential for relapse.
- Elucidate brain pathways and mechanisms involved with specific substances with potential for abuse and those shared among such substances. Expand our understanding of the pathways and mechanisms that underlie co-occurring substance use disorders with other mental illnesses.
- Understand the neurodevelopmental processes that influence the likelihood of developing substance use disorders and/or behavioral and substance addictions later in life, including the identification of which systems, processes, and temporal periods will be most productive for intervention.
- Expand knowledge of the neurobiology of risk perception, impulsivity, behavioral disinhibition, decision-making, information processing, and implicit cognition.
- In the psychosocial research arena, explore intersections between reinforcement/reward behaviors and substance use behaviors related to stress and anxiety reduction.

- Further examine the correlation of genetic variation with addiction vulnerability, and explore the possibility of distinct predispositions to specific substances or combinations of substances.
- Expand our understanding of how genes, epigenetic factors, environment, and development (including prenatal exposure) interact to influence the various risk/protective factors and disease trajectories of substance use and behavioral addictions.
- Model specific features of the addictive trajectory for mechanistic studies.
- Create a national resource for the comprehensive and standardized study of addiction, including a central repository for blood, genetic information, imaging data, clinical information, patient registries, and brain tissue, as well as the technological infrastructure and harmonized data fields that would permit meaningful analysis of the data in these resources.
- Develop biomarkers of chronic substance use, including poly-substance abuse.
- Develop theoretical and animal models of substance abuse or addiction co-morbidity, integrating genetic, neurobiological, psychological, behavioral, cognitive, and environmental components, with particular emphasis on combinations of factors that are synergistic or supra-additive.

Prevention Sciences

- Develop a better understanding of the patterns and trajectories of substance abuse and other maladaptive behaviors (e.g., gambling, compulsive eating), particularly how use or engagement in one impacts others.
- Identify both common and distinct etiological factors across substances of abuse and addictive behaviors, including what characteristics determine whether an individual will follow a path towards excess, and if they do, what that trajectory would be for various substances and their combination.
- Examine the intersection of developmental stage, social context, and genes to better understand the initiation of substance use and susceptibility/resilience toward transitioning from use to abuse.
- Take advantage of new technologies (e.g., GPS and other wireless devices) to track substance abuse and addiction risk behaviors and factors that influence their occurrence.
- Develop more effective prevention strategies; adapt or optimize existing interventions for different and/or multiple substances or behaviors, settings, and/or populations; and determine how to promote adoption of evidence-based practices.

- Identify sources and contributions to differential susceptibility to substance use or behavioral addiction and examine what individual characteristics determine whether an individual will follow a pathway toward excess, and if they do, which pathway of excess will be pursued.
- Determine how risk factors for substance use, heavy intake, addiction, and associated problems develop, including whether there are points of vulnerability (e.g., associated with age, primary drug(s), recovery pathway, gender, race/ethnicity, sexual orientation, or presence of co-occurring medical/mental health disorders) where prevention efforts may be most effective.
- Monitor changes in public policies with regard to their impact on substance abuse and the availability of evidence-based prevention programs, identifying synergies and trade-offs in policy effects on multiple health-related behaviors and outcomes. Develop and employ appropriate causal modeling techniques to estimate policy effects and effectiveness.

Treatment Sciences

- Develop effective behavioral, pharmacological, and biological (e.g., vaccines) interventions for treating addiction that are targeted to specific sub-populations, based on poly-substance addiction, psychiatric, or other illness comorbidities.
- Design clinical trials that more accurately reflect real-world conditions (e.g., greater inclusion of poly-substance abusers or persons with comorbid mental health disorders).
- Develop biomarkers and/or genetic –based methodology for monitoring treatment outcomes in individuals with substance abuse and addictive behaviors.
- Identify the potential molecular targets associated with compulsive self-administration of addictive substances, with the potential for subsequent development of vaccines or other pharmacotherapies that block the pharmacologic activity of the abused substance.
- Develop markers of treatment adherence for substance abuse and addiction clinical trials, and strategies to promote compliance, including use of wireless technologies, social networks, etc.
- Identify more cost-effective, population-based interventions for substance abuse and addiction that can serve as a first line of intervention.
- Identify the biological, psychological, and social factors that promote resiliency and recovery in substance abuse patients and the impact of using one substance on the likelihood of substitution or relapse to other substances of abuse or addictive behaviors.
- Elucidate the factors that prohibit substance abusing individuals from getting treatment, in order to remove these barriers and encourage/motivate patient recognition and utilization of effective addiction and substance abuse treatments.

- Develop approaches for the integration of comprehensive early detection, screening, and treatment of substance use disorders (e.g., alcohol, tobacco, and illicit or nonmedical prescription drug use) into general medical and pediatric settings via evidenced-base practice models, using novel technologies (e.g., mobile and electronic health tools).
- Develop evidence-based treatment algorithms for substance abusers that specify modifications to treatment for non-responders.
- Develop innovative and integrative approaches for treating addiction with related comorbid conditions (e.g., mental illness, chronic pain, and HIV).
- Develop a better understanding of the mechanisms through which substance abuse and addiction treatments work, including identification of the “active ingredients” of multi-component interventions.
- Leverage existing research networks, including ones that work with the criminal justice system, to focus on drug abuse, alcoholism, and related comorbidities, as appropriate.
- Determine how the implementation of new public policies will affect treatment, service delivery, and potential expansion of the population seeking treatment for substance abuse.

Medical Consequences

- Understand the mechanisms by which moderate alcohol drinking combined with other drugs of abuse or prescription drugs potentiate risk for organ disorders/injuries and other adverse outcomes.
- Conduct clinical studies on drug abusing subgroups with health vulnerabilities that may arise from poly-substance abuse (e.g., individuals who do not drink to excess but also take illicit drugs).
- Explore the interaction of potentially abused substance that are known teratogens (e.g., alcohol and tobacco) with other drugs of abuse (e.g., opiates) and other aspects of maternal lifestyle (e.g., nutrition) in human prenatal neurodevelopment, including the identification of biomarkers that may be predictive of addiction-related outcomes later in life.
- Examine the biological, cellular, and molecular mechanisms by which in utero substance exposure may influence later propensity for substance abuse and/or behavioral and substance addictions.
- Understand the impact of poly-substance abuse on driving to inform drugged driving policies.
- Expand research on the impact of drug and alcohol abuse on HIV risk and progression.