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Addiction Genetics: A Harbinger of Advanced Research and New Treatment for Addiction

Doo-Sup Choi*
Editor-In-Chief

Molecular Pharmacology and Psychiatry
Mayo Clinic College of Medicine

Drug abuse and addiction cause immensely challenging problems in our society, affecting more than 5% of the worldwide population and costing approximately 3% of the world gross domestic product [3,10,11]. Legal, educational and social systems are limited in their capacity to reduce the socio-economical burdens of addiction. At the same time, currently available pharmaceutical medications are not sufficient to treat diverse types of addiction [2]. Contributing to this problem is our lack in understanding of this abnormal human behavior, so we often raise fundamental scientific questions. Why are some individuals more susceptible to abusing substances such as alcohol, nicotine, cocaine, methamphetamine, heroin, etc., while others are resilient? Are there common genetic or environmental factors that contribute to addiction? How do inherited components interact with environmental factors in the addiction process? Are there unique attributes to each form of addiction? Do non-substance addictions, including gambling or internet addiction, share common neurobiological or genetic features with other substance-addictions? Are there better ways to treat addiction?

With the advent of new tools in genetics, genomics and epigenetics, we have renewed hope for answering the above questions. Genetic contributions to addiction have been a hallmark of addiction research in the last decade [4], yet pinpointing direct relationships between genes and addictive processes still remains elusive. Because of heterogeneity in the genetics of addictive behaviors, there is a constant need to develop more advanced and translatable addiction disease models using primates, rodents, zebrafish, *Drosophila*, and *C. elegans*. Genetic study does not simply refer to mutated DNA in genes, it also comprises drug-induced transcriptional changes through epigenetic mechanisms [12] altering neuroadaptation and behavior in a long-lasting manner. Very recently, the encyclopedia of DNA elements (ENCODE) projects revealed the functionality of non-coding sequences comprising various *cis*-acting elements, chromatin structures, and DNA methylation sites, which open a new era of advanced genetic studies in the addiction

field [14]. Understandably, since the brain orchestrates different behaviors through specific neural circuits, the role of genes in these circuits is one of the most important features of addiction research [5,6,13]. Genetic research pursues not only the etiology of addiction, but also the critical need to develop effective treatment methods. For example, a recent study demonstrated that a genetic variant of a mu-opioid receptor appears to determine efficacy of naltrexone in human alcohol-dependents [1].

Addiction and several co-morbid psychiatric disorders share many common neurobiological features. Recent advances in psychiatric studies employing animal models [8] are enabling us to understand the complex nature of addiction at the molecular level. Many efforts are being carried out to establish a genetic association with behavioral dysfunction using imaging genetics to investigate structural and functional variations in the brain as a result of addiction [7]. In addition, converging information from preclinical to clinical studies will increase the possibility of identifying genetic contributions to addiction and lead to the identification of more efficacious treatment options [9]. Using a combination of pharmacogenetics, pharmocogenomics, pharmacometabolomics, and imaging, the development of an individualized treatment method will revolutionize future medical intervention in the field.

Although there are many journals covering a broad array of topics in addiction research, our purpose is to establish a high-quality journal focusing on the genetics of addiction. I firmly believe that *Addiction Genetics* will play an essential role as a harbinger of understanding in this field and will cover the most novel and interesting findings on the genetic contribution to addiction, from model organisms to clinical studies. In striving to uphold acceptance of the highest quality research, many renowned scientists in our field have joined the editorial board of this journal. Their impeccable academic acumen will be paramount in determining the quality of the articles and advocate the necessity of the journal. It is important to note however, that success of the journal will rely primarily on support from author contributors and reviewers. We are committed

*E-mail: dschoi@versita.com

to a transparent and speedy reviewing process, which will be an essential component in attracting submissions to *Addiction Genetics*. In addition, article processing charges will be waived

for the first two years to promote the accessibility of the journal. Therefore, I welcome you to join us in this fresh and integrated journal by submitting your exciting manuscripts.

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