I15 Variation in Genes Affecting Dopamine Turnover, Oxytocin, and Serotonin in Inmate and Student Populations

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After attending this presentation, attendees will gain knowledge concerning the relationship between Single Nucleotide Polymorphisms (SNPs) associated with genes of oxytocin, serotonin, and dopamine as well as specific behavioral traits. Furthermore, attendees will learn about these genetic differences in an inmate population compared to a student control population.

This presentation will impact the forensic science community by demonstrating the genetic influence on aggressive and antisocial behavior. These behaviors have become a major problem as the United States currently has the highest incarceration rate in the world. Moreover, antisocial and aggressive behavior are two of the leading causes of mental health referrals. The strong heritability and environmental issues surrounding criminal activity indicates that a genetic underlying can help explain at least some features related to these behaviors.

Behavior is a complex process influenced by both genetics and the environment. Some neurotransmitters have been associated with social behavioral traits, including: Oxytocin (OXT), Serotonin (5-HT), and Dopamine (DA). Certain genes (such as genes of receptors, transporters, and enzymes involved in metabolic pathways of these neurotransmitters) are associated with these neurotransmitters. These genes contain polymorphic sites that can be studied to relate or link them to certain behavioral traits. SNPs are single-base variations found at a specific location on the genome and are considered to be the most abundant type of polymorphism in humans. While some associations between SNPs and behavior have been made, this study analyzes multiple SNPs within the three most common ethnic groups in the United States (Caucasian, Hispanic, and African American) in both inmate and student populations.

This study analyzed a total of 17 SNPs: 12 SNPs associated with DA turnover (rs2283739, rs1799836, rs3788862, rs909525, rs979605, rs740603, rs737865, rs739388, rs1611115, rs165599, rs4680, and rs129882), two SNPs associated with the OXT gene (rs877172 and rs4813625), two SNPs related to the serotonin receptor (5HTR2A) (rs6314, and rs6311), and one SNP located within the serotonin transporter gene (5-HTT) (rs25531) using Single-Base Extension (SBE). A student sample set (N=200) and inmate sample set (N=100) were genotyped, and individuals participated in a survey designed to assess 31 behavioral traits.

Significant associations were found within the control population for two SNPs associated with OXT and 5-HT: rs6314 and antisocial behavior in Hispanics (p=0.008), and rs877172 and antisocial behavior in Caucasians (p=0.001). Furthermore, statistically significant differences in haplotype frequencies were observed in inmate vs control populations in SNPs associated with dopamine turnover (monoamine oxidase; MAOA). These results indicate that these SNPs play an important role in social behavior, including antisocial behavior.

The results of this study provide some evidence that OXT, 5-HT, and enzymes related to DA turnover can influence behavior. It was found that SNPs associated with these neurotransmitters influence antisocial behavior. These behavioral SNPs may be used in early prevention or treatment of psychiatric disorders, which have a large impact the medical field and criminal justice system. Furthermore, understanding the influence of OXT, 5-HT, and DA on behavior may help explain the etiology of aggressive and antisocial behavior.

Single Nucleotide Polymorphism, Oxytocin, Dopamine

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