I2 Genetic Study of DNA Polymorphisms in Androgen Receptor, Serotonin Transporter, and Monoamine-Oxidase Genes in an Inmate Sample

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After attending this presentation, attendees will understand how analyzing specific genetic polymorphisms located in genes associated with aggressive behavior can lead to significant differences between an inmate sample and controls.

This presentation will impact the forensic science community by revealing a possible mechanism that would explain the predisposition for aggressive behavior which may provide valuable information for criminal behavior analysts and profilers. Studies show that self-reported questionnaires are the most commonly utilized technique for analyzing the level of aggression in an individual. A major disadvantage to this technique is the uncertainty that the reported values reflect the true behavior of the individual. Therefore, research focused on DNA profiling to determine an individual's predisposition for aggression may be useful to understand the mechanisms which regulate aggressive behaviors.

Emotional responses are controlled by a complex system of neurotransmitters in the brain. Genetic polymorphisms located in the coding genes of neurotransmitter receptors, enzymes, and transporters have been shown to modulate the transcription of these proteins. The interaction and modulation of central neurotransmitters and related proteins (receptors, transporters, and metabolic enzymes) affect emotional behaviors such as aggression. Associations between aggressive behavior and specific polymorphisms on the Androgen Receptor (AR), the Monoamine Oxidase A (MAOA-VNTR), and the serotonin transporter (5-HTTLPR) genes have been previously reported. This research intends to compare the allele frequencies of repeat variants located in AR, MAOA, and 5-HTT genes between inmates and a control population of Texas. Buccal swabs were collected from male inmates incarcerated at a jail located in southern Texas (N=98) and from control male students at Sam Houston State University (N=93). All samples were extracted using organic extraction with ethanol precipitation, quantified, amplified, and then analyzed by capillary electrophoresis with fluorescent detection. For 5-HTT, departures from the Hardy-Weinberg equilibrium were detected in the inmate sample ($p<0.01$) but not in the control group. Significant differences were observed in allele frequencies of MAOA-VNTR ($p<0.05$) and AR ($p<0.01$) but not in 5-HTT, when both samples were compared. MAOA alleles 2 and 3 showed higher frequency in the inmate sample. Research has shown that alleles 3.5 or 4 are transcribed more efficiently, whereas alleles 2, 3, or 5 show lower levels of transcription. Allele 4 has been classified as a high-activity MAOA allele, while alleles 2 and 3 are known as low-activity MAOA alleles. The low-activity MAOA has been associated in past studies with increased levels of antisocial and criminal behavior. Higher frequency of shorter AR alleles (<23 repeats) was also detected in the inmate group. Previous studies have shown that shorter Cytosine-Adenine-Guanine (CAG) repeats are associated with impulsive-disinhibited personality traits and increased verbal aggression. Although no significant differences were detected in 5-HTT, the very long allele was observed only in the inmate sample. The results obtained for the AR and MAOA polymorphisms support the hypothesis that the inmate population would display a higher frequency of short repeats which, in turn, is associated with aggressive behavior.

However, contrary to the hypothesis, no differences were observed for the 5-HTT polymorphism. This discrepancy may be attributed to the limited size of the sample. Overall, the results support current studies in human and animal models; however, much research is still required to understand the complex mechanisms which regulate aggressive behaviors.

Monoamine-Oxidase, Serotonin Transporter, Androgen Receptor

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