



## Psychiatry & Behavioral Sciences Section – 20??

### I9 MAOA and SLC6A4 Genotyping and Testimony at Criminal Trials

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After attending this presentation, attendees will learn how testimony regarding behavioral genomics and gene x environment interactions may be appropriate at criminal trials.

This presentation will impact the forensic science community by increasing the awareness within the forensic community of recent research regarding behavioral genomics and its application to criminal trials.

Should testimony regarding behavioral genomics be presented at criminal trials? Philosophers, physicians, and mental health professionals have thought for hundreds of years that human behavior is driven by some combination of nature (heredity, family history, genetics, genomics), nurture (parental upbringing, influence of peers, good and bad life experiences), and free will. There are three ways in which a specific individual's genetic make-up may be relevant to his or her behavior: (1) *The person's genotype may exactly designate a psychiatric or medical diagnosis that clearly explains the person's abnormal behavior.* An example is Huntington's disease, an autosomal dominant neurodegenerative disorder that causes psychosis, dementia, and sometimes violent behavior. In this circumstance, the genotype determines the diagnosis and there is a distinct causal relationship between the genotype and the behavior. (2) *The person's genotype may support a psychiatric diagnosis that has been made on clinical grounds.* For example, a person who is homozygous for the short allele of the *SLC6A4* (serotonin transporter) gene is more likely to become depressed and suicidal after stressful situations than a person who is homozygous for the long allele of that gene (based on Caspi et al., Influence of Life Stress on Depression: Moderation by a Polymorphism in the *5-HTT* Gene, *Science*, 2003.). In this circumstance, the genotype does not *make* the diagnosis of severe depression, but it *supports* the diagnosis that was made on clinical grounds. (3) *The person's genotype may help to explain a person's violent or criminal behavior.* For example, a male who has the low activity allele of the *MAOA* gene and who experienced serious child maltreatment is more likely to manifest violent and antisocial behavior as an adult than a male who has the high activity allele of this gene (based on Caspi et al., Role of Genotype in the Cycle of Violence in Maltreated Children, *Science*, 2002.). In this circumstance, the genotype does not make a specific diagnosis or support a specific diagnosis, but it does help to explain that a particular person may have a predisposition to maladaptive behaviors. The interaction between genetic and environmental factors has been called G x E interaction. Testimony regarding these and similar G x E interactions may be appropriate in the penalty phase of a trial regarding mitigation and perhaps in juvenile court. That is, a defense attorney might argue that the defendant did not ask to have a particular genetic makeup and never asked to be the victim of child abuse. But these factors – without his desire, knowledge, or awareness – make it more likely he would commit a violent act later in life. The faculty of Vanderbilt Forensic Services have genotyped 20 criminal defendants for the *MAOA* and *SLC6A4* genes. In this paper, the results of this genotyping and will relate examples of testimony regarding behavioral genomics at several criminal trials including one case in which this testimony apparently affected the outcome of the trial, will be presented.

**Genotyping, Gene X Environment Interaction, Testimony**