

GENES AS A DEFENSE TO HOMICIDE: TRENDS IN NEUROCRIMINOLOGY

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Abstract

One of the emerging areas in the field of neurocriminology is the unearthing of a possible relationship between genes and violent criminal behaviors. Several recent studies revealed strong links between genetic variation in a monoamine oxidase gene (MAOA) and aggressiveness. The gene is responsible for translating enzymes key for catabolizing amine neurotransmitters such as dopamine, serotonin, and noradrenaline that are related to mood and behaviors. Critical changes of these genes result in Brunner syndrome characterized by lower intelligence quotient, problematic impulsive behavior, and unpredictable mood swings. Moreover, the gene has been associated with a variety of psychiatric disorders such as antisocial personality, as well as gang involvement, and a rise in weapons use. In the last two decades, a significant increase in the use of neuroscientist experts to testify in criminal proceedings has been relied upon across the United States. Based on a qualitative analysis of relevant case law, the study finds that the gene can be linked with the violent behaviors of offenders, and defense attorneys can readily get the evidence admitted at trial. However, this study shows that the behavioral genetic defense fails in two-thirds of murder cases. The extent to which genes can be blamed for antisocial behavior remains illusory. This body of court rulings suggests that the so-called “warrior gene” defense fails to exonerate an individual for homicide.

Keywords: *Warrior gene, neurocriminology, MAOA gene, MAOA-L, criminal defense.*

1. Introduction

One of the emerging aspects of modern development in the field of neurocriminology is the unearthing of a possible relationship between genes and violent criminal behaviors. Studies have revealed that there are strong links between genetic variation and aggressiveness related to the enzyme monoamine oxidase (MAO) (McDermott et al., 2009). In a landmark study, Dutch professor Han Brunner noted the absence of the enzyme when he was studying family members’ odd and sometimes violent behaviors. Testing revealed that the family’s nine male members exhibited an alternative form of a gene that leads to an absence of the enzyme MAO responsible for breaking down key neurotransmitters. In addition, the males had a reduced IQ, introverted nature, and poor social interactions. It was postulated that these individuals become vulnerable to risk-taking and frequent violent outbursts (Brunner et al., 1993).

Nearly a decade later, Duke professor Avshalom Caspi and colleagues demonstrated that children who suffered maltreatment were less likely to demonstrate aggressive behavior in adulthood if they possessed a gene that resulted in high levels of MAO (Caspi et al., 2002). The MAOA gene is responsible for translating enzymes that catabolize amine neurotransmitters such as dopamine, serotonin, and noradrenaline that are related to mood and behaviors. In short, Dr. Caspi correlated childhood mistreatment in those with low levels of MAOA with higher levels of social deviance and involvement in other criminal activities.

In 2006, New Zealand researchers seeking a biomarker for addictive behavior and response to substance use noted a high number of MAOA repeats among Maori tribal research participants (Lea & Chambers, 2007). These MAOA repeats had previously been linked with aggressive responding, and so the MAOA was quickly dubbed the “warrior gene.” The number of variable number of tandem repeats (VNTR) of the genetic allele has been mapped to a propensity for aggressive responding because these repeats impact the efficiency of gene expression and, in turn, enzymatic activity. Repeats numbering 2, 3, and 5 manifest as a lower level of MAOA activity (MAOA-L), and, consequently, a higher propensity for violent responding, whereas 3.5 and 4 repeats result in normal levels (Gardner, 2020).

This intriguing gene continues to be studied. A Finnish study carried out to assess the genes of nearly 900 convicted offenders who were classified according to the severity of the crime showed that

most extreme violence or crimes match the warrior gene groups of the offender (Tiihonen et al., 2015). This study was pivotal in illustrating that the most violent antisocial behaviors and crimes committed have a close relation to the MAOA-L genotype. This research concluded that, even though other factors may contribute, the MAOA-L gene strongly accounted for the highest likelihood of violent crimes and other antisocial behaviors. Moreover, the gene has been associated with a variety of antisocial behaviors, gang membership involvement, and an increase in weapon uses (Beaver et al., 2010).

In the last two decades, a significant rise in the use of neuroscientific evidence in U.S. criminal proceedings has been observed. The extent to which genes can be blamed for criminal behavior, in particular homicide, has yet to be fully understood. But based on these preliminary findings from court cases in which the defense employed the defendant's positive MAOA-L as a defense, several jurisdictions do allow evidence that the gene can be linked with the violent behaviors of offenders. However, in the majority of cases, the behavioral genetic defense does not alter the case outcome.

2. Methods

Westlaw's electronic legal database was searched for cases with no beginning date restriction up to August 15, 2021 to identify court documents from criminal cases referencing the MAOA genotype. Search terms included MAO, MAO-A, MAOA, MAOA-L, and monoamine oxidase. The legal database search contained selected trial and appellate court documents from state and federal jurisdictions throughout the United States.

3. Results

The search yielded records from eleven criminal cases. All of the cases involved defense of homicide in various stages of the judicial process, from conviction to sentencing to appeal. The cases range in date from 1995, a mere two years following the original study linking the gene to violent behavior, to 2020. The cases were, then, categorized according to whether the genetic make-up of the defendant was deemed admissible or inadmissible. The genetic evidence was deemed admissible in six of the eleven cases. In the other five cases, genetic evidence was either deemed inadmissible or genetic testing was denied. These cases were examined and socio-legal conclusions were drawn concerning the viability of a behavioral genetic defense. One-third of cases where genetic evidence was admitted showed favorable outcomes for the accused, either as a down-graded charge or reduction in sentencing. However, in two-thirds of cases where the genetic evidence was admitted and used as a defense to homicide, there was no change in the case outcome.

3.1. Cases in which MAOA genetic evidence was admissible

The first recorded criminal proceeding where MAOA behavioral genetic evidence was deemed admissible in a defense to murder was *State of Tennessee v. Waldroup* (2011). Waldroup shot and killed his wife's friend following a dispute and attempted to sexually assault and murder his estranged wife. Evidence was admitted from a forensic psychiatrist who opined that Waldroup harbored a genetic predisposition to violent impulses in the form of the MAOA-L gene and he was also abused as a child. The jury found him guilty of a lesser offense, voluntary manslaughter predicated on diminished capacity to formulate the requisite intent for first- or second-degree murder.

A year later, the defendant in an Arkansas case was spared the death penalty during sentencing of his murder conviction (*State of Arkansas v. Bourassa*, 2012). Bourassa, who had bludgeoned an elderly church-goer to death in 2010, tested positive for the MAOA 3R variant and also suffered significant childhood trauma and sexual assault. This evidence was admitted during the sentencing phase and he was given a life sentence instead of capital punishment.

In *People v. Adams* (2014), the Supreme Court of California addressed the question of whether genetic evidence can be used to elicit sympathy from the jury. Adams, a gang member, shot three rival gang members at close range in 1994. He was convicted of triple homicide, as well as carjacking. Genetic testing presented by the defense at sentencing showed that Adams had inherited the 3-repeat allele MAOA gene. In addition, expert testimony was presented that the defendant had been severely maltreated as a child, and that he had learning disabilities, abnormal EEG, and structural differences related to impulse-control on neuroimaging. The defendant received the death penalty which was upheld on appeal.

In *State of Missouri v. Driskill* (2015), while under the influence of drugs, the defendant raped, murdered, and subsequently burned the bodies of an elderly couple who had earlier caught him stealing from their yard shed. Multiple neuro- and psychiatric experts testified that Driskill had numerous psychiatric disorders, that he was positive for the MAOA gene linked to violent behavior, and that he had suffered childhood abuse. The defendant was sentenced to death.

In *Colbert v. State of Tennessee* (2015), the defendant kidnapped, raped, and killed his girlfriend by shooting, strangulation, and driving over her. To avoid the death penalty, the defendant pleaded guilty. During sentencing, a molecular geneticist presented evidence of genetic predisposition to violence via the MAOA-L gene. There were no allegations of childhood mistreatment. The maximum available sentence was assigned: life in prison. Colbert appealed, citing ineffective assistance of counsel for the defense's disinclination to present genetic evidence at trial. The trial court judgment was affirmed.

Finally, most recently, in *Wells v. State of Texas* (2020), Wells shot and killed his pregnant girlfriend and her relative. The trial court sentenced him to death, triggering an automatic appeal. At trial, a multitude of experts examined, tested, and testified that Wells harbored the MAOA gene, that he had suffered complex developmental trauma, and that multiple factors converged resulting in impulsive propensities. His trial defense was predicated on a propensity for violence due to factors beyond his control, including genetics, his brain structure, and his childhood environment. Furthermore, evidence was excluded of an Italian psychiatrist with a PhD in neuroscience who testified that, in addition to the MAOA gene, Wells' genetic profile was positive for a variant of the 5HTTLPR gene, the rs25531 gene, the DRD4-2/11 gene, and the STin2 gene—all linked to various psychiatric vulnerabilities, hyperactivity, impulsivity, and violence. The expert concluded that having this many genetic predispositions would heighten one's propensity to violent behavior exponentially. Ultimately, the court found the "panoply" of genetic evidence to be scientifically unreliable. The trial court was affirmed.

3.2. Cases in which genetic evidence was inadmissible or otherwise excluded

The most significant case in this category is the recent case of *State of New Mexico v. Yopez* (2015). Yopez killed his mother-in-law's boyfriend after an argument and burned the body. He was convicted of second-degree murder. The trial court excluded evidence offered by the defense concerning Yopez's MAOA gene and heightened susceptibility to violence, and the appellate court reversed. The Supreme Court of New Mexico ultimately held that: 1) expert testimony that the defendant was predisposed to impulsive violent behavior due to low levels of MAOA activity was not supported by scientific methodology; 2), the study finding that people with no-activity MAOA genotype were impulsively aggressive did not support defense expert opinions that, on the basis of the defendant's low-activity MAOA genotype, he was predisposed to impulsive aggression; and 3) evidence of mere genetic susceptibility to a given mental condition is not relevant on the issue of deliberate intent, at least in the absence of evidence that such susceptibility is so well understood and has such strong predictive value as to be clinically validated as an indicator of the mental condition.

In three of the five remaining cases, the appellate court ruled that failure to mount a genetic defense predicated on the MAOA gene/environment interaction and resultant heightened violent propensity did not amount to "ineffective assistance of counsel." Specifically, in *Mobley* (1995), the defendant shot and killed a pizza store manager. Mobley had an affluent background, but family members testified to the violent tendencies of several male relatives. Nonetheless, the family tree differed markedly from the X-linked pattern of the Dutch family which was the subject of Brunner's 1993 study. The motion for genetic testing was denied because "the theory behind the request for funds will not have reached a scientific stage of verifiable certainty in the near future" and "Mobley could not show that such a stage will ever be reached" (*State v. Mobley*, 1995, p. 263).

Again, in the court-martial proceeding *United States v. Duran* (2014), a hallucinating marine attacked with a machete a military officer who then lived. Evidence was presented that the defendant suffered from atypical psychosis, PTSD, depression, schizoid personality disorder, and a history of child abuse. Experts testified that Duran was able to formulate the requisite intent, to appreciate the wrongfulness of his act (primarily because he fled the scene), and competent to stand trial. The U.S. Government denied genetic testing, asserting that "[t]he science on the connection between this MAOA gene and aggression is not settled" (Government Answer of 15 Jul 2013 at 23). He was convicted and sentenced to 15 years confinement, in addition to total forfeitures, reduction to pay grade E-1, and a dishonorable discharge. On appeal, Duran argued that genetic testing for the MAOA-L gene was "reasonable professional assistance" and that failure to pursue it amounted to deficient performance. The petition was denied and the judgment affirmed.

Similarly, in *Bathgate* (2001), where the defendant had pleaded guilty to stabbing and killing a man, the court denied a writ of *habeas corpus* for failure to follow Maine's state procedure. Bathgate based his writ on ineffective assistance of counsel for failure to mount a behavioral genetic defense based on the MAOA-L gene. Bathgate did not, as is required, bring and preserve this issue for appeal at the state level. In essence, no Certificate of Appealability was issued by the appellate court because there was no substantial issue that could be presented on appeal.

Lastly, in *State of Tennessee v. Idellfonso-Diaz* (2006), the defendant was found guilty of premeditated murder after he struck a pregnant woman while driving, then returned to the scene and shot

the pregnant woman, killing her and her unborn child. The defendant failed to test positive for the MAOA gene but instead tested positive for a gene linked to depression. An expert witness also testified that the defendant exhibited a mild brain abnormality on PET, a history of abuse, PTSD, and was intoxicated at the time of the murders. The expert did not testify that these various vulnerabilities to violence, genetic and otherwise, did not completely render him lacking in capacity to formulate the requisite intent. Rather, he testified that “all of these factors together would have impaired him, to some extent” (*State v. Idellfonso-Diaz*, 2006, at 2). The State of Tennessee moved to prohibit this expert’s testimony, and the trial court overruled. The appellate court deemed this ruling an error and remanded the case for further proceedings.

4. Discussion

There are a number of study limitations related to the heterogeneity of the case pool. Firstly, the biggest impact that might be realized in mounting a behavioral genetic defense is a reduction in sentencing from death penalty to prison term. However, states differ as to their punishment jurisprudence. For example, one cannot accurately compare the impact of this neuroscientific defense upon juries in Texas and Maine where implementation of the death penalty is concerned, the latter having abolished the death penalty in 1887 and the former having a long history of imposing the death penalty in capital cases (Death Penalty Information Center, 2022). In some jurisdictions, life in prison or lengthy prison sentence is the only punishment available. Factoring in a genetic predisposition to violence might be likely to move a jury or judge not to impose the death penalty, but determining an appropriate sentence reduction in terms of years when the death penalty was never sought would be more difficult. Secondly, we also see that a downgraded charge might result from the use of genetic testing. Again, not every state offers this option. And particular fact patterns may support a lesser offense and a downgraded charge may not be a result of the jury’s incorporation of the MAOA-violence genetic linkage. For example, the Waldroup case is one in which a first-degree murder charge, which requires premeditation, was downgraded to involuntary manslaughter, which instead requires a “state of passion produced by adequate provocation sufficient to lead a reasonable person to act in an irrational manner.” It is difficult to determine from the written opinion whether there existed some level of provocation or the jury simply “shoehorned” the impulsivity feature of MAOA-L into the definition of diminished capacity. Similarly, for the court to admit scientific evidence, especially that relates to genes as a criminal defense, it must meet the *Frye* or *Daubert* evidentiary standard which differs from state to state. Thirdly, to emphasize the markedly differing fact patterns, there was clear evidence of advanced planning in some cases, and in others, the fact pattern is much more impulsive in nature. For example, in *Driskill* and *Adams*, evidence painted a picture of a planned revenge killing rather than impulsive homicide. Fourth, this research does not address the thought process of the juries and judges involved. Some research has shown that juries are much more likely to factor in structural brain compromise (visible on neuroimaging) than evidence of biochemical changes in decisions to downgrade the charge or reduce sentencing (although this was not evident in the *Adams* case). In addition, if the jury is taking the behavioral genetic evidence to heart, it remains unclear whether the genetic predisposition warrants exoneration or the jury, then, becomes concerned about recidivism.

Recently, three judges in separate jurisdictions (*Mobley*, *Duran*, and *Bathgate*) ruled that a genetic defense does not constitute “reasonable professional assistance;” failure to mount such a defense is not ineffective assistance of counsel and the defendant is not entitled to genetic testing. However, it is well-settled law that failure to employ DNA testing on evidence is ineffective assistance, and failure to raise the insanity defense in a homicide case as an affirmative defense is ineffective assistance of counsel. Ineffective assistance of counsel in these particular contexts is new ground.

Finally, in the case of *Yepez*, which is the only case in which admissibility of the MAOA gene was solely at issue, the court disallowed the evidence mainly because the science has not determined a one-to-one relationship exists between having the gene and committing the violent act. However, in *Adams*, expert testimony, ruled admissible, likened harboring the MAOA-L and child abuse connection to harboring a bad heart gene and being fed a poor diet.

5. Conclusion

Despite study limitations, a number of conclusions can be drawn. In a majority of cases in which the defendant employs a behavioral genetic defense predicated on MAOA-L, via expert testimony and accepted science, the gene can be linked with the violent behavior of offenders, and, thus, defense attorneys can readily get this evidence admitted at trial. However, this evidence is unlikely to change the outcome for the defendant. In order to alter the case outcome, the defense’s expert must be able to testify

that the genetic profile coupled with past child abuse renders the defendant completely unable to formulate the requisite intent, or premeditation, for homicide. Testimony that the gene/abuse presence is but one contributing factor will be inadequate to affect the outcome in the guilt phase. As for the sentencing phase, testimony of MAOA-L can be used to mitigate the circumstances; the most likely outcome favorable to the defense is the sentence reduction of life sentence in lieu of the death penalty. Lengthy sentences, however, have not been reduced. Appeals in recent years brought by defendants who have alleged ineffective assistance of counsel for the attorney's failure to pursue a genetic defense in the homicide case have been denied. It remains to be seen whether these types of defenses will be deemed "reasonable professional assistance" in the future. The extent to which genes can be blamed for antisocial behavior in the United States remains illusory, as court rulings suggest that the so-called "warrior gene" defense is unsuccessful in exonerating an individual for homicide.

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