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Study finds genomic changes in the brains of people who commit suicide

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Are genes destiny? Alternatively, are we simply the products of our environment? There is a growing sense that neither of these two possibilities fully captures the essence of the risk for psychiatric disorders. New light is being shed on the complex interaction of genetic and environmental factors as the result of growth in the field of epigenetics. While genetics is the study of how variation in gene sequence or "genotype" influences traits or "phenotypes," epigenetics (epi- from the Greek meaning outside or above) is the study of heritable changes in gene function that may occur without modifying the gene sequence, often as a consequence of environmental exposures.

There are an increasing variety of epigenetic mechanisms that have been described, including the regulation of gene function via the methylation or demethylation of DNA. The study by Drs. Michael Poulter and Hymie Anisman and colleagues in the October 15th issue of *Biological Psychiatry* illustrates one exciting new example in this area of research, an epigenetic study of depression/suicide. The researchers compared the brain tissues of those who had major depressive disorder and committed suicide to those from a control group who died suddenly, from heart attacks and other causes.

They found the genome in people who have committed suicide as a result of major depression was being chemically modified by a process that is normally involved in regulating cell development. As Poulter explains, "We have about 40,000 genes in every cell and the only reason a skin cell becomes a skin cell as opposed to a heart cell is because only

a fraction of the genes are being expressed, and the other genes not being expressed are shut down by this genetic process of DNA methylation."

The rate of methylation in the suicide brains was found to be nearly ten times that of the control group, and the gene being shut down was a neurotransmitter receptor that plays a major role in regulating behavior. John H. Krystal, M.D., Editor of *Biological Psychiatry* and affiliated with both Yale University School of Medicine and the VA Connecticut Healthcare System, comments, "This is exciting new evidence that genetic and environmental factors may interact to produce specific and long-lasting modifications in brain circuits. Further, these modifications may shape the course of one's life in extremely important ways, including increasing the risk for major depressive disorder and perhaps suicide."

"The whole idea that the genome is so malleable in the brain is surprising, because brain cells don't divide. You get dealt your neurons at the start of life, so the idea that there are still epigenetic mechanisms going on is pretty unusual," adds Poulter. The authors note that these observations open an entirely new avenue of research and potential therapeutic interventions.

Source: Elsevier