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PTSD research: Distinct gene activity patterns from childhood abuse

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Abuse during childhood is different. A study of adult civilians with PTSD (post-traumatic stress disorder) has shown that individuals with a history of childhood abuse have distinct, profound changes in gene activity patterns, compared to adults with PTSD but without a history of child abuse.

A team of researchers from Atlanta and Munich probed blood samples from 169 participants in the Grady Trauma Project, a study of more than 5000 Atlanta residents with high levels of exposure to violence, physical and sexual abuse and with high risk for civilian PTSD.

The results were published this week in *Proceedings of the National Academy of Sciences*, Early Edition.

"These are some of the most robust findings to date showing that different biological pathways may describe different subtypes of a psychiatric disorder, which appear similar at the level of symptoms but may be very different at the level of underlying biology," says Kerry Ressler, MD, PhD, professor of psychiatry and behavioral sciences at Emory University School of Medicine and Yerkes National Primate Research Center.

"As these pathways become better understood, we expect that distinctly different biological treatments would be implicated for therapy and recovery from PTSD based on the presence or absence of past child abuse."

The first author of the paper is Divya Mehta, PhD, a postdoctoral fellow in Munich. The senior author is Elisabeth Binder, MD, PhD, associate professor of psychiatry and behavioral sciences at Emory and group leader at the Max-Planck Institute of Psychiatry in Munich, Germany.

Ressler, a Howard Hughes Medical Institute Investigator, is co-director of the Grady Trauma Project, along with co-author Bekh Bradley, PhD, assistant professor of psychiatry and behavioral sciences at Emory and director of the Trauma Recovery Program at the Atlanta Veterans Affairs Medical Center.

Mehta and her colleagues examined changes in the patterns of which genes were turned on and off in blood cells from patients. They also looked at patterns of methylation, a DNA modification on top of the four letters of the genetic code that causes genes to be 'silenced' or made inactive.

Study participants were divided into three groups: people who experienced trauma without developing PTSD, people with PTSD who were exposed to child abuse, and people with PTSD who were not exposed to child abuse.

The researchers were surprised to find that although hundreds of genes had significant changes in activity in the PTSD with and without child abuse groups, there was very little overlap in patterns between these groups. The two groups shared similar symptoms of PTSD, which include intrusive thoughts such as nightmares and flashbacks, avoidance of trauma reminders, and symptoms of hyperarousal and hypervigilance.

The PTSD with child abuse group displayed more changes in genes linked with development of the nervous system and regulation of the immune system, while the PTSD minus child abuse group displayed more changes in genes linked with apoptosis (cell death) and growth rate

regulation. In addition, changes in methylation were more frequent in the PTSD with child abuse group. The authors believe that these biological pathways may lead to different mechanisms of PTSD symptom formation within the brain.

The Max Planck/Emory scientists were probing gene activity in blood cells, rather than brain tissue. Similar results have been obtained by researchers studying the influence of child abuse on the brains of people who had committed suicide.

"Traumatic events that happen in childhood are embedded in the cells for a long time," Binder says. "Not only the disease itself, but the individual's life experience is important in the biology of PTSD, and this should be reflected in the way we treat these disorders."

More information: D. Mehta et al. Childhood maltreatment is associated with distinct genomics and epigenetic profiles in postraumatic stress disorder. *PNAS Early Edition* (2013).

Provided by Emory University

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