Father's early-life exposure to stress associated with child's brain development

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The FinnBrain research of the University of Turku has demonstrated for the first time that the stress the father has experienced in his childhood is connected to the development of the white matter tracts in the child's brain. Whether this connection is transmitted through epigenetic inheritance needs further research.

Evidence from multiple new animal studies demonstrates that the changes in gene function caused by environment can be inherited between generations through gametes. In particular, nutrition and stress have been proven to cause these types of changes. However, these do not alter the nucleic acid sequence of the DNA; environment appears to alter function of the genes through so-called epigenetic mechanisms.

New discoveries on the role of epigenetics in the regulation of gene function have led to whole new considerations about the mechanisms of inheritance as researchers used to think that acquired characteristics cannot be inherited. These types of phenomena transmitted from one generation to other have not, however, been studied much in humans.

In the FinnBrain research, the researchers identified 72 families with information about the early stress experiences of both parents and MR image of the child's brain taken at the age of few weeks available.

The researchers discovered that the father's exposure to stress was connected to quicker development of white matter tracts in the child's brain. The white matter tracts are made up of "cables" connecting different parts of the brain, and they have a central role in brain function. The relationship between father's exposure to stress and the development of the child's white matter tracts remained even when the researchers took into consideration the impact of the mother's early stress exposure and other possible contributing factors during the pregnancy.

According to Professor Hasse Karlsson, who is the principal researcher of FinnBrain, the significance of the discovery on the later development of the child is still unclear:

"The relevance of our study is that this type of connection in humans was discovered in the first place. To be able to investigate whether these types of connections are actually transmitted through the epigenetic changes in sperm cells, we have started to collect the fathers' semen samples and study these epigenetic markers together with a research group led by Professor Noora Kotaja from the University of Turku."

More information: Hasse Karlsson et al. Association of Cumulative Paternal Early Life Stress With White Matter Maturation in Newborns, *JAMA Network Open* (2020). DOI: 10.1001/jamanetworkopen.2020.24832

Provided by University of Turku

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