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Could Poverty Increase Risk of Depression by Influencing the Expression of Genes?

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Low socioeconomic status is a major risk factor for the development of depression. Some studies have estimated that the proportion of cases due to lower socioeconomic status is as high as 26-40 percent for adolescent depression. But while it is clear that low socioeconomic status increases risk for depression, what remains to be determined is how this risk takes shape – and new data suggests a potential biological pathway of risk.

There are many factors that likely act in conjunction to increase risk for depression amongst individuals of low socioeconomic status; these include increased exposure to stress, crowding and poor housing quality, exposure to neighborhood violence, and increased family discord or chaos. New findings from our research suggest that low socioeconomic status may also alter biology in ways that could make individuals more susceptible to the depressogenic effects of stress.

Our DNA contains genes that code for proteins, large molecules that can perform a range of functions, including helping our brains transmit chemical messages. Even though the genetic code for our DNA stays largely the same throughout our lives, chemical tags can attach to DNA and change when or how often certain genes are expressed, or used to make proteins. These tags are called “epigenetic” markers, because they attach to DNA and, unlike our genetic code, readily change throughout our lives. In our research, we followed a group of adolescents over time to examine how a range of risk factors affected changes in epigenetic marks on one gene that has previously been tied to depression. Half of the adolescents in our sample were already at high risk for depression because they had a close family member who had experienced the disorder.

What we found was that adolescents growing up in families with lower socioeconomic status accumulated more epigenetic marks over a two-year period compared to adolescents from families with higher socioeconomic status. Because these marks were on a gene that affects chemical messaging in the brain, we also examined whether changes in these epigenetic marks were associated with changes in brain activity. Here, we found that more marks over time predicted increases in the activity of the amygdala, a deep brain structure that helps coordinate our bodily response to stress as well as learning about threats in our environment.

Finally, we found that the high-risk adolescents who had increased amygdala activity subsequently reported increased symptoms of depression one year later. Although we do not know exactly why increased activity in the amygdala predicts future depression symptoms, one possibility is that it may make adolescents more reactive to stress. Though preliminary, these findings do suggest that low socioeconomic status in adolescence could increase risk for depression by influencing the expression of genes that affect chemical messaging in the brain.

This isn’t the first research to suggest that low socioeconomic status could alter gene expression and increase risk for future health problems. For example, other researchers have shown that low socioeconomic status in childhood predicts increased expression of genes that are associated with inflammation in adulthood, which may contribute to increased risk for health problems such as cardiovascular disease.

Broadly, research examining epigenetics in human health and disease is in its very early stages and there are many potential limitations and unanswered questions. For example, our measures of epigenetic markers come from participants’ blood, because we can’t measure these directly in the brain; thus, it remains an open question whether the markers observed in blood correspond to epigenetic markers in the brain. Also, socioeconomic status explains relatively small amounts of the changes that we see in epigenetic markers and brain function; clearly, there is much more to the story involving what is contributing to changes in these epigenetic markers.

There is also much to learn about the timing of these changes—we looked over a two-year period during adolescence, but it is possible that changes happen much faster than that and at earlier periods of development. We also do not know whether these markers are less likely to change at later periods in development, and what it is about low socioeconomic status (for example, increased exposure to stress) that may influence these changes.

Though preliminary, the growing evidence from early studies calls for further research to examine how low socioeconomic status in childhood and adolescence may lead to changes in epigenetic markers that influence the brain, and ways in which we might be able to mitigate the risk associated with these changes.

Depression is one of the leading causes of disability worldwide and substantially increases risk for physical health problems as well as suicide. Finding ways to prevent or treat it early on during adolescence could have long-term impacts for not only individual health and wellbeing but also global economy and productivity.

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