Study links prenatal exposure to stress with accelerated cell aging

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Young adults whose mothers experienced psychological trauma during their pregnancies show signs of accelerated aging, a UC Irvine-led study found.

The researchers discovered that this prenatal exposure to stress affected the development of chromosome regions that control cell aging processes. The study results, which appear online this week in the Proceedings of the National Academy of Sciences, point to the importance of maternal health and well-being during pregnancy.

"Our previous research on prenatal stress exposure has shown its effects on long-term metabolic, immune, endocrine and cognitive function," said the paper's lead author, Dr. Pathik D. Wadhwa, UCI professor of psychiatry & human behavior, obstetrics & gynecology, pediatrics, and epidemiology. "But this is the first to show the impact of prenatal stress on cell aging in humans, and it sheds light on an important biological pathway underlying the developmental origins of adult disease risk."

Study participants were healthy 25-year-old women and men born to mothers who had, during pregnancy, experienced psychosocial stress in the form of major, traumatic life events, such as the death or sudden severe illness of an immediate family member. Blood tests revealed that subjects' white blood cells had aged an average of three and a half more years - five among women - than those of individuals whose mothers had uneventful pregnancies.

This hastened aging was evidenced by the shortened length of telomeres, repetitive stretches of DNA-protein complexes that cap and protect the ends of chromosomes. Telomeres maintain chromosomal stability and control the processes that underlie cellular aging by functioning as a "clock" that regulates how many times a cell can divide. The shorter the telomere strands, the faster the cell ages.

The telomere maintenance system plays an important role in human disease and longevity, and scientists now know that telomere length is correlated to the risk of disease and premature mortality in humans. Truncated telomeres - such as those found in the white blood cells of study participants - can, for example, be a precursor to diabetes, cancer and coronary heart disease.

"These results indicate that stress exposure in intrauterine life is a significant predictor of adult telomere length - even after accounting for other established prenatal and postnatal influences on telomere length," said Sonja Entringer, UCI assistant professor of pediatrics and first author on the paper.

A rapidly emerging body of human and animal research indicates that intrauterine conditions play an important role not only in all aspects of fetal development and health across gestation and birth, but also in a wide range of physical and mental health outcomes over an individual's entire lifespan.

Provided by University of California - Irvine