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Violence puts wear and tear on kids' DNA

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Children who have experienced violence might really be older than their years. The DNA of 10-year-olds who experienced violence in their young lives has been found to show wear and tear normally associated with aging, a Duke University study has found.

"This is the first time it has been shown that our telomeres can shorten at a faster rate even at a really young age, while kids are still experiencing stress," said Idan Shalev, a post-doctoral researcher in psychology and neuroscience at the Duke Institute for Genome Sciences & Policy.

Telomeres are special DNA sequences found at the tips of chromosomes; much like the plastic tips of shoelaces, they prevent DNA from unraveling. Emerging evidence suggests that telomeres are "master integrators," connecting stress to biological age and associated diseases.

Telomeres are known to get shorter each time cells divide, putting a limit on the number of times a given cell can go on dividing. Smoking, obesity, psychological disorders and stress have been found to possibly accelerate that process of telomere loss. In that sense, our telomeres may reflect biological age, not just chronological age.

Previous studies of telomeres and stress had primarily looked at telomeres in adults as they recalled experiences much earlier in their lives.

In the new study, Shalev took advantage of the Environmental-Risk Longitudinal Twin Study led by Duke's Avshalom Caspi and Terrie

Moffitt that has followed 1,100 British families with twins since the time those twins were born in the 1990s. The twins are now 18-year-old adults, but the researchers performed the analysis on DNA samples collected when they were just five and 10 years old. The researchers also know, based on extensive interviews held with the twins' mothers, which of them experienced some form of violence in their younger years, including domestic violence, frequent bullying or physical maltreatment by an adult.

The new report in the journal *Molecular Psychiatry* shows that a subset of those children with a history of two or more kinds of violent exposures have significantly more telomere loss than other children. Since shorter telomeres have been linked to poorer survival and chronic disease, this may not bode well for those kids.

"Research on human stress genomics keeps throwing up amazing new facts about how stress can influence the human genome and shape our lives," said Caspi, the Edward M. Arnett Professor of Psychology and Neuroscience.

The findings suggest a mechanism linking cumulative childhood stress to telomere maintenance and accelerated aging, even at a young age. It appears to be an important way that childhood stress may get "under the skin" at the fundamental level of our cells.

"An ounce of prevention is worth a pound of cure," said Moffitt, who is the Knut Schmidt Nielsen Professor of Psychology and Neuroscience. "Some of the billions of dollars spent on diseases of aging such as diabetes, heart disease and dementia might be better invested in protecting children from harm."

The Duke team plans to further explore the new findings by measuring the average length of telomeres in the twins now that they are adults.

They'll also repeat the study in a second, older group of 1,000 individuals in the Dunedin Study, who have been under observation since their birth in the 1970s in New Zealand.

More information: "Exposure to Violence During Childhood is Associated with Telomere Erosion from 5 to 10 Years of Age: A Longitudinal Study," Idan Shalev, Terrie Moffitt et al. *Molecular Psychiatry*, April 24th. doi:10.1038/mp.2012.32

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