



Brief Commentary

Telomere length: A marker of disease susceptibility? ☆

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Telomeres, the caps found at the ends of chromosomes, have clinical significance for health: a growing literature links shorter telomeres with depression, poor health behaviors, age-related diseases, and mortality (Epel et al., 2010; Lin et al., 2012). Elegant prior work by Cohen and his colleagues clearly demonstrated that psychological stress and socioeconomic status (SES) alter infectious disease risk (Cohen et al., 2013). In their newest paper, Cohen and colleagues show that adults with lower SES during childhood had shorter telomeres on CD8+CD28⁻ T-cells and were more likely to develop the common cold than adults with a higher childhood SES (Cohen et al., 2013). The authors argue that lower childhood SES speeds the progression to replicative senescence in CD8+CD28⁻ T-cells, an important T-cell subset because of its role in cancer and viral illnesses; shorter CD8+CD28⁻ telomeres reflect greater senescence (Cohen et al., 2013). Accordingly, childhood SES could have a far-reaching impact on disease susceptibility.

Inflammation may be one mechanism linking lower childhood SES to shortened telomeres; inflammation triggers T-cell proliferation, one known cause of telomere shortening (Kiecolt-Glaser et al., 2013). Indeed, converging evidence suggests that other forms of childhood adversity, such as abuse or neglect, are linked to elevated levels of inflammation and shortened telomeres. For example, adults who experienced more early life adversity had higher inflammation and shorter telomeres than adults who experienced less early life adversity (Kiecolt-Glaser et al., 2011). Importantly, Cohen's paper suggests that early childhood stressors may affect immune function throughout the lifespan (Cohen et al., 2013); related work has demonstrated that adult SES also has immune consequences, potentially because low SES adults report high levels of stress and depression (Jaremka et al., 2013). For instance, adults with lower subjective SES had stronger inflammatory responses to a laboratory speech task than those with higher subjective SES, and tended to rate the task as more threatening and less manageable

(Derry et al., 2013). Taken together, previous research and the new Cohen paper suggest that low SES and early life stress can elevate inflammation, thereby shortening telomeres and increasing infectious disease susceptibility during adulthood.

Prior work investigating the links among SES, early life adversity, inflammation, and disease susceptibility often utilized relatively healthy adult samples. Indeed, Cohen and colleagues tested their hypotheses with a unique sample of extremely healthy adults (Cohen et al., 2013); their volunteers were free from major medical comorbidities and were not taking medication other than birth control. Furthermore, their average age was 29.8, with a range from 18 to 55. The odds of needing prescription medication for one or more chronic conditions rise steeply during middle age, and thus their sample represents the very best case scenario in terms of physical and mental health.

Although telomere attrition is an important correlate of aging, health status affects this relationship. For example, healthy centenarians had longer telomeres than centenarians who had two or more chronic health conditions (Terry et al., 2008). Accordingly, chronic illness may further accelerate age-related telomere shortening. Indeed, many chronic diseases, including cancer, have inflammatory correlates or consequences (Jaremka et al., 2013). In this context, elevated inflammation among cancer survivors carries clear risks for accelerated aging. The tissue damage resulting from surgery, chemotherapy, and radiation may evoke inflammatory responses and thus shorten telomeres. Furthermore, many people reduce physical activity and gain weight during cancer treatment; low physical activity and adiposity are risk factors for higher inflammation and shorter telomeres, placing cancer survivors at further risk of accelerated aging.

Depression, which affects a subset of cancer survivors, promotes inflammation and the premature aging of immune cells (Hewitt et al., 2003; Jaremka et al., 2013). Accordingly, the combination of depression and inflammatory-related chronic diseases may be a particularly potent challenge to cell aging. The findings by Cohen and colleagues suggest that this accelerated cell aging may affect disease susceptibility among cancer survivors; shortened telomeres enhance risk of infectious (Cohen et al., 2013) and age-related diseases (Epel et al., 2010). Indeed, cancer survivors experience higher rates of other comorbid illnesses, such as cardiovascular disease, than those who have not had cancer (Hewitt et al., 2003); infectious disease risk may also be higher.

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In sum, inflammation and accelerated cell aging represent important pre-disease mechanisms that may be improved or worsened through multiple behavioral and biomedical pathways (Kiecolt-Glaser et al., 2013). Because short telomeres predict early disease, slowing immune cell aging could have broad effects by slowing the onset of age-related diseases.

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