Center for the Study of Aging and Human Development
Duke University

EMBARGOED UNTIL JULY 6th, at 3:00 PM U.S. Eastern Time (*PNAS*):

TITLE: Quantification of Biological Aging in Young Adults

A research team led by Dan Belsky, Avshalom Caspi, and Terrie Moffitt at Duke University reports that the process of aging is already highly variable among people still in their 20s and 30s Young people who are aging rapidly are already showing signs of physical and cognitive decline in their 30's.

PUBLICATION SOURCE: Proceedings of the National Academy of Sciences of the United States of America, to appear online the week of July 6, 2015.

FINDINGS:

- As we age, our risk for diseases rises. These diseases affect many different organ systems in our bodies. This implies that improving health in later life will require interventions that can actually slow the aging process. Doing so will prevent multiple age-related diseases simultaneously.
- Aging is a process of decline in the functioning of many organ systems simultaneously. Our research shows that this process is already happening in young adults who are still decades away from developing age-related diseases.
- Accelerated aging in young adults predicts the very same symptoms of advanced aging that we see in older adults: Deficits in physical and cognitive functioning, subjective feelings of ill-health, and even looking older to others.

WHY ARE THESES FINDINGS IMPORTANT:

- Breakthroughs in research on aging in worms, flies, and mice are beginning to produce novel therapies to slow human aging. The first clinical trials are being designed now.
- Currently, most research to slow aging in humans focuses on older adults.
- Our findings show that in older adults, processes of accelerated aging may already be well-entrenched and difficult to modify.
- New treatments aim to prevent multiple age-related diseases at once by slowing down the aging process. These treatments may be most effective when delivered to recipients who are still relatively young.

SUPPORTING DETAILS:

Two approaches to measuring aging. We measured Dunedin Study members' aging in two ways. First, we took a snapshot of their physiologies when they were 38 years old. We used an algorithm developed out of the US Centers for Disease Control and Prevention's National Health and Nutrition Survey (NHANES) to calculate a "Biological Age." Although they were all chronologically 38 years old when their data were collected, Study members ranged in their Biological Age from under 30 to over 60. We next looked at how Study members' bodies changed over time from when they were 26 years old to when they were 38 years old. We examined their cardiovascular, metabolic, and immune systems, their kidneys, livers, and lungs, their dental health, and their DNA (18 different biomarkers in all) when they were 26, 32, and 38. For each member of the Study, we calculated how each biomarker changed over the 12-year period. Finally, we composited these changes into a single index that quantified that person's own "Pace of Aging." Some Study members appeared to age not at all—they were physiologically the same when we saw them at age 26 and, 12 years later, when they were 38. Most study members aged at a normal pace—1 year's worth of physiological change for each chronological year that passed. Some Study members aged much faster, aging 2 or 3 years physiologically with the passage of each chronological year.

Young adults who were aging more rapidly showed signs of aging commonly observed in older adults. Young adults we measured as aging faster showed worse balance and poorer motor coordination, they were physically less strong, and they reported having more trouble completing daily tasks like climbing stairs or carrying groceries. These fast-aging young adults also showed evidence of cognitive decline—compared to baseline testing they completed as children, their IQ scores had gone down by age 38. Photographs of their retinal microvasculature told a similar story, indicating increased risk for stroke and dementia.

Changes in fast-aging young adults were visible to the naked eye. Study members who we measured as aging faster reported feeling in worse health. Age-related changes weren't on the inside only. Duke University undergraduates who rated facial photographs of the Study members tended to rate the fast-agers as looking older.

PARTICIPANTS: Participants were members of the Dunedin Multidisciplinary Health and Development Study, which tracks the development of a birth cohort of 1,037 children born in 1972-1973 in Dunedin, New Zealand. This birth cohort's families represent the full range of socioeconomic status and health in the general population. Follow-ups have been carried out at ages 3, 5, 7, 9, 11, 13, 15, 18, 21, 26, 32, and most recently at age 38 years, when 95% of the living cohort members took part. We examined 954 cohort members who participated in repeated clinical assessments at ages 26, 32, and 38 years.

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UNIVERSITIES INVOLVED: Duke University, Durham, NC, USA; University of Otago, Dunedin, NZ; Institute of Psychiatry, Kings College London, UK.

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