Study finds the role of genes is greater with living to older ages

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Genes appear to play a stronger role in longevity in people living to extreme older ages, according to a study of siblings led by Boston University and Boston Medical Center (BMC) researchers.

The study, published online in the *Journal of Gerontology: Biological Sciences*, found that for people who live to 90 years old, the chance of their siblings also reaching age 90 is relatively small - about 1.7 times greater than for the average person born around the same time. But for people who survive to age 95, the chance of a sibling living to the same age is 3.5 times greater - and for those who live to 100, the chance of a sibling reaching the same age grows to about nine times greater.

At 105 years old, the chance that a sibling will attain the same age is 35 times greater than for people born around the same time - although the authors note that such extreme longevity among siblings is very rare.

"These much higher relative chances of survival likely reflect different and more potent genetic contributions to the rarity of survival being studied, and strongly suggest that survival to age 90 and survival to age 105 are dramatically different phenotypes or conditions, with very different underlying genetic influences," the authors conclude.

The study, led by Paola Sebastiani, PhD, professor of biostatistics at the BU School of Public Health, analyzed survival data of the families of 1,500 participants in the New England Centenarian Study, the largest study of centenarians and their family members in the world, based at

BMC. Among those families, the research team looked at more than 1,900 sibling relationships that contained at least one person reaching the age of 90.

Sebastiani and co-author Thomas Perls, MD, MPH, professor of medicine at the BU School of Medicine and the centenarian study's founder and lead investigator, said the findings advance the idea that genes play "a stronger and stronger role in living to these more and more extreme ages," and that the combinations of longevity-enabling genes that help people survive to 95 years are likely different from those that help people reach the age of 105, who are about 1,000 times rarer in the population.

They said that previous studies of the determinants of survival to older ages have been clouded by researchers not being precise about what they call aging, life span, longevity, or even exceptional longevity.

"For a long time, based upon twins' studies in the 1980s and early '90s, scholars have maintained that 20 to 30 percent of longevity or even life span is due to differences in genes, and that the remainder is due to differences in environment, health-related behaviors or chance events. But the oldest twins in those studies only got to their mid- to late-80's," said Perls. "Findings from this and other studies of much older (and rarer) individuals show that genetic makeup explains an increasingly greater portion of the variation in how old people live to be, especially for ages rarer than 100 years."

Perls and Sebastiani said there is considerable inconsistency in the gerontological literature concerning definitions of aging, longevity and life span.

"The casual use of these terms leads to confusing claims regarding heredity and non-replicated genetic studies," Perls said. "Many researchers equate the term 'longevity' with 'old age,' and neither term is adequately specific."

Because genes play a much stronger differentiating role in living to 105-plus years, studies of such individuals are "much more powerful in discovering longevity-related genes than studies of people in their 90s," he said.

Sebastiani, Perls and co-authors call for investigators probing genetic influences to be precise in describing the rarity or percentile of survival that study subjects achieve.

Provided by Boston University Medical Center

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