Genetic memory of starvation may curtail lifespan of men

December 5 2016

Credit: Tel Aviv University

New Tel Aviv University research suggests that periods of fasting or starvation may significantly shorten the lifespans of both children and their male descendants.

The study focused on survivors of a mass famine that took place in the early 1920s in several rural regions of Russia. It was led by Prof. Eugene Kobyliansky of TAU's Sackler School of Medicine and conducted by doctoral student Dmitry Torchinsky of TAU's Raymond and Beverly Sackler Faculty of Exact Sciences, in collaboration with Dr. Leonid Kalichman of Ben-Gurion University's Department of Physical Therapy and Prof. David Karasik of Bar Ilan University's Faculty of Medicine in

the Galilee. Its conclusions were published in The *American Journal of Clinical Nutrition*.

"A variety of experimental and epidemiological studies have tried to propose that intermittent or periodic fasting, like caloric restriction, may slow the aging process and extend lifespans," said Prof. Kobyliansky. "But there is also evidence demonstrating that even moderate caloric restriction may not extend but, on the contrary, can shorten the human lifespan."

A lesson from Russia

Past research suggests a strong correlation between telomere dynamics and the processes that determine human aging and lifespan. Telomeres, compound structures at the end of each chromosome that protects the end of the chromosome from deterioration, are the genetic key to longevity. They shorten with every chromosome replication cycle.

The team evaluated telomere lengths in a population-based sample comprised of survivors of the mass famine of the early 1920s and in the survivors' descendants, who originated from Chuvashia, a rural area in the mid-Volga region of Russia. In Chuvashia, the proportion of starving inhabitants reached 90% in late March 1922, and mortality among starving peasants reached between 30-50%. The situation only began to improve in April 1923. By the end of that year, the mass famine in Chuvashia was considered over.

The researchers arrived at three major discoveries: (1) There were shorter leukocyte telomeres in men born after 1923 after the mass famine ended than in men born before 1922; (2) there was a stable inheritance of shorter telomeres by men born in ensuing generations; and (3) there was an absence of any correlation between shorter telomeres and women born before or after the event.

"This study, while demonstrating that starvation has the potential to shorten telomere length, raises several questions," said Prof. Kobyliansky. "Does starvation exert a stronger effect on telomere length in the reproductive cells of adults than in the leukocytes of children? Is starvation-induced telomere shortening a sex-dependent phenomenon? And would fasting regimens exerting beneficial effects be accompanied by telomere shortening in descendants?"

The team is currently considering experimental in vivo studies to answer these and other questions.

More information: E. Kobyliansky et al, Leukocyte telomere length pattern in a Chuvash population that experienced mass famine in 1922-1923: a retrospective cohort study, *American Journal of Clinical Nutrition* (2016). DOI: 10.3945/ajcn.116.138040

Provided by Tel Aviv University