

## Older Dads Have Healthier Kids Than You Think

Older fathers often get blamed for passing on genetic mutations to their children, causing some types of autism, schizophrenia, and other disorders. But new data presented at the meeting suggest that children of older fathers and grandfathers may inherit at least one advantage from aging patriarchs: longer telomeres, structures at the tips of chromosomes that may protect against aging and disease. And the effect is amplified over the generations: “We’ve shown that the paternal grandfather’s age is associated with longer telomeres in his grandchildren,” graduate student Dan Eisenberg of Northwestern University in Evanston, Illinois, reported in a talk.

Telomeres are repetitive sequences of DNA that prevent the ends of chromosomes from unraveling, much like the plastic tips on the ends of shoelaces. As cells divide and replicate, telomeres get shorter and eventually can no longer prevent the fraying of DNA and the decay of aging. Recent studies have found a link between living to 100 and having a hyperactive version of telomerase, an enzyme that keeps telomeres long.

Telomeres in sperm cells, however, are exceptional: Several studies have shown that they grow longer, not shorter, over the years, probably because telomerase activity is high in testes. As a result, sperm cells from older men have longer telomeres than those of younger men. That would suggest that the older a father is at conception, the longer the telomeres his sons and daughters inherit.

Working with Northwestern biological anthropologist Christopher Kuzawa and anthropological geneticist Geoff Hayes, Eisenberg examined data from a long-term study of 3327 women who were pregnant in 1983 in the Cebu Longitudinal Health and Nutrition Survey in the Philippines. They had gathered the ages of fathers and in 2005 measured telomere length in the blood of 1845 moms and 1681 children.

Children of older fathers did indeed have longer telomeres than those

of younger dads: For each additional decade of age in fathers at conception, sons and daughters had 4% longer telomeres, a finding that corroborates earlier work. The Northwestern group also found that for every additional decade of age in grandfathers, the grandchildren’s telomeres added another 4%. But grandfathers did not pass on their longer telomeres to their daughters’ children, only their sons’, suggesting that this is a paternal effect.

The increase in telomere length per year of fathers’ age is just about the same amount as telomere length lost per year in normal aging, Eisenberg says. So the longer telomeres in sperm roughly offset normal aging, giving children of older dads an advantage. “It’s as if you delay reproduction, you earn this kind of higher fitness for your offspring,” says biological anthropologist Koji Lum of Binghamton University in New York.

Any benefit in telomere length may still be swamped out by the risk of passing on more mutations, Eisenberg warns: “We don’t know yet the net health effect.” So at the moment, he’s not advising anyone to delay fatherhood.

—A.G.



**Grandfather effect.** Older fathers in the Philippines passed on long telomeres to their sons and grandsons.

of how the skeleton changed from the time modern humans spread through Europe 30,000 years ago until they were circling the globe in jets by the 1960s. In 10 posters, Ruff and his colleagues focused on how each part of the body, from the spine to leg and arm bones, evolved over time through both genetic and cultural change.

One of the most significant findings is a dramatic drop in strength in leg bones. Leg bending strength, or resistance to fracture, declined by 25% to 33% from 27,000 years ago to 1900 C.E., as shown by the cross-sectional dimensions of the upper and lower leg bones of 1834 men and 786 women, according to a poster by Brigitte Holt of the University of Massachusetts, Amherst, and her colleagues. This is “huge,” Ruff says. “We interpret this to reflect the move from a hunting-gathering lifestyle to a more sedentary agricultural lifestyle across Europe.” Our ancestors needed stronger legs to walk farther, especially if carrying goods.

Over the same 30,000-year period, upper body strength declined after the introduction of agriculture. In males, it then increased in the Medieval period, possibly due to intensive upper-body labor such as blacksmith-



**Strong-arm tactics.** Men had stronger right arms, perhaps from throwing spears and other activities, before the invention of agriculture.

ing. One trend through time is that the right arm lost much of its asymmetric larger size compared to the left arm, perhaps due to fewer strongly lateralized activities such as spear throwing. Women show particularly symmetrical arms from the beginning of agriculture 7000 years ago to Europe’s

Bronze Age, 3000 years ago. The researchers suspect that this stems from using both arms to make flour with grinding stones.

As for overall height, about 30,000 years ago, European men stood 1.72 meters tall, almost as tall as Europeans today. Their height and weight dropped steadily until 4000 years ago, probably because of poorer nutrition and health, particularly with the advent of agriculture 10,000 years ago. With a few exceptions—for example, milk-drinking Scandinavians—Europeans got even shorter during the Medieval period and stayed short until 1900.

The study has produced “an awesomely comprehensive picture of skeletal adaptation,” says bioarchaeologist Clark Spencer Larsen of Ohio State University in Columbus, who was not part of the team. Jay Stock of the University of Cambridge in the United Kingdom agrees that the study is a “major milestone. ... It is a major achievement to quantify human variation through time and space with this resolution.” —ANN GIBBONS