Analysis of teeth suggests modern humans mature more slowly than Neanderthals did

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A Neanderthal man ancestor's reconstruction. Neanderthal children grew up faster than humans, according a study Monday that suggested that modern kids' lengthy childhoods may be a relatively new phenomenon that has boosted our longevity.

A sophisticated new examination of teeth from 11 Neanderthal and early human fossils shows that modern humans are slower than our ancestors to reach full maturity. The finding suggests that our characteristically slow development and long childhood are recent and unique to our own species, and may have given early humans an evolutionary advantage over Neanderthals.

The research, led by scientists at Harvard University, the Max Planck Institute for Evolutionary Biology (MPI-EVA), and the European Synchrotron Radiation Facility (ESRF), is detailed in the Proceedings of

the National Academy of Sciences.

"Teeth are remarkable time recorders, capturing each day of growth much like rings in trees reveal yearly progress," says Tanya M. Smith, assistant professor of human evolutionary biology at Harvard. "Even more impressive is the fact that our first molars contain a tiny 'birth certificate,' and finding this birth line allows scientists to calculate exactly how old a juvenile was when it died."

Compared to even early humans, other primates have shorter gestation, faster childhood maturation, younger age at first reproduction, and a shorter overall lifespan. It's been unclear exactly when, in the 6 to 7 million years since our evolutionary split from non-human primates, the life course shifted.

Smith and her colleagues found that young Neanderthals' teeth growth -- a proxy for overall development -- was significantly faster than in our own species, including some of the earliest groups of modern humans to leave Africa some 90,000 to 100,000 years ago. This indicates that the elongation of childhood has been a relatively recent development.

State-of-the-art synchrotron imaging of the tiny upper jaw of a Neanderthal child allows scientists to count tiny growth lines inside the first molar teeth and determine that it died at age 3. Image: Fossil courtesy: Université de Ličge, Belgium; Photo credit: Graham Chedd, Paul Tafforeau, Tanya Smith

Such studies add to the growing body of evidence that subtle developmental differences exist between us and our Neanderthal cousins. The recent sequencing of the Neanderthal genome has provided tantalizing genetic clues pointing to differences in cranial and skeletal development between Neanderthals and modern humans.

The current study involves some of the most famous Neanderthal children ever discovered, including the first hominin fossil, discovered in Belgium in the winter of 1829-30. This individual was previously thought, based on comparisons with modern humans, to have been four to five years old at the time of death. Now, powerful synchrotron X-rays

and biological rhythms inside teeth have revealed the child was only three years old.

While counting lines in teeth isn't a new method, Smith says, doing it "virtually" using synchrotron micro-computed tomography is.

"These new methods present a unique opportunity to assess the origins of a fundamentally human condition: the costly yet advantageous shift from a primitive 'live fast and die young' strategy to the 'live slow and grow old' strategy that has helped to make humans one of the most successful organisms on the planet," Smith says. Humans' extended maturation may have facilitated additional learning and complex cognition, possibly giving early Homo sapiens an advantage over their Neanderthal cousins.

More information: Smith, T.M., Tafforeau, et al. Dental evidence for ontogenetic differences between modern humans and Neanderthals, *Proc. Natl. Acad. Sci. USA*, November 15, 2010.

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