

ANTHROPOLOGY

No Sex with Homo Sapiens

Results from new research undertaken at the Max Planck Institute for Evolutionary Anthropology have revealed that Neanderthals and modern humans apparently began to evolve separately around 660,000 years ago and did not propagate with each other. The scientists have published the full gene sequence of the mitochondria, the cellular powerhouse, of a 38,000-year-old Neanderthal man. Understanding this gene sequence has made it possible to make a detailed comparison with known gene sequences in human mitochondria. (CELL, August 8, 2008)

When modern man colonized Europe around 35,000 years ago, he encountered a different species of human – the Neanderthal. At the Max Planck Institute for Evolutionary Anthropology, research is currently underway into whether the two groups fought each other, lived side by side, or even lived together. An international team working with department head Svante Pääbo is decoding the Neanderthal genome (Neanderthal Genome Project). Many millions of base pairs have already been found. In addition, the scientists have now sequenced the entire mitochondrial DNA (mtDNA), which includes 13 protein-encoding genes.

"For the first time, we have been able to sequence the entire Neanderthal mitochondrial DNA by piecing together many fragments," explains Richard Green, who headed the study. In total, the researchers used so many fragments that the genome was created 35 times. "This means that the sequence can be considered practically error-free," says Green. Together with his colleagues, he examined the bones of a Neander-

thal man who died around 38,000 years ago, and whose remains were discovered in 1980 in Vindija Cave in Croatia. These bones were special because, unlike other samples, they were comparatively uncontaminated by any other DNA.

The researchers focused on the DNA of the mitochondria, which, as a basic part of the egg cell, is inherited only from the mother. From 300 mg of bone material, the researchers were able to isolate 8,341 fragments of DNA ranging in length from 30 to 278 base pairs. Assembled like a jigsaw puzzle, these fragments yielded a mitochondrial genome with 16,565 elements – almost exactly as long as that of modern man.

The scientists then compared this gene sequence to that of Homo sapiens. This revealed that the Neanderthal mtDNA did not match any of the variants that researchers have found in living humans. The investigations thus offered no proof that Neanderthals and modern humans had interbred. It appears that their ancestors started to evolve separately around 660,000 years ago (give or take 140,000 years).

These results also confirm the assumption that the Neanderthal population was relatively small. "Most paleoanthropologists assume that, 40,000 years ago, there were just a few thousand Neanderthals wandering around Europe," says Johannes Krause, a co-author of the study.

Decoding the mitochondrial genome is merely a preliminary to decoding the entire Neanderthal genome – including the DNA in the cell nucleus. "We are very pleased to be able to use the full genomic analysis to research human evolution. This result is just the tip of the iceberg in fully sequencing the Neanderthal genome," says Svante Pääbo. ●

In 1980, the 38,000-year-old bones of a Neanderthal man were found in Vindija Cave in Croatia. Max Planck researchers have now fully decoded his mitochondrial DNA.



PHOTO: MPI FOR EVOLUTIONARY ANTHROPOLOGY – JOHANNES KRAUSE



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