

Study finds humans still evolving, and quickly



Stephen Morrison / EPA

Plaster casts of skulls, from left to right, of the earliest fossil finds of humanoids to modern man at the National Museum of Kenya in Nairobi, November 8, 2007.

The pace has been increasing since people started spreading through Europe, Asia and Africa 40,000 years ago.

By Karen Kaplan, Los Angeles Times Staff Writer

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The pace of human evolution has been increasing at a stunning rate since our ancestors began spreading through Europe, Asia and Africa 40,000 years ago, quickening to 100 times historical levels after agriculture became widespread, according to a study published today.

By examining more than 3 million variants of DNA in 269 people, researchers identified about 1,800 genes that have been widely adopted in relatively recent times because they offer some evolutionary benefit.

Until recently, anthropologists believed that evolutionary pressure on humans eased after the transition to a more stable agrarian lifestyle. But in the last few years, they realized the opposite was true -- diseases swept through societies in which large groups lived in close quarters for a long time.

Altogether, the recent genetic changes account for 7% of the human genome, according to the study published in the Proceedings of the National Academy of Sciences.

The advantage of all but about 100 of the genes remains a mystery, said University of Wisconsin-Madison anthropologist John Hawks, who led the study. But the research team was able to conclude that infectious diseases and the introduction of new foods were the primary reasons that some genes swept through populations with such speed.

"If there were not a mismatch between the population and the environment, there wouldn't be any selection," Hawks said. "Dietary changes, disease changes -- those create circumstances where selection can happen."

One of the most famous examples is the spread of a gene that allows adults to digest milk.

Though children were able to drink milk, they typically developed lactose intolerance as they grew up. But after cattle and goats were domesticated in Europe and yaks and mares were domesticated in Asia, adults with a mutation that allowed them to digest milk had a nutritional advantage over those without.

As a result, they were more likely to have healthy offspring, prompting the mutation to spread, Hawks said.

The mechanism also explains why genetic resistance to malaria has spread among Africans -- who live where disease-carrying mosquitoes are prevalent -- but not among Europeans or Asians.

Most of the genetic changes the researchers identified were found in only one geographic group or another. Races as we know them today didn't exist until fewer than 20,000 years ago, when genes involved in skin pigmentation emerged, Hawks said. Paler skin allowed people in northern latitudes to absorb more sunlight to make vitamin D.

"As populations expanded into new environments, the pressures faced in those environments would have been different," said Noah Rosenberg, a human geneticist at the University of Michigan, who wasn't involved in the study. "So it stands to reason that in different parts of the world, different genes will appear to have experienced natural selection."

Hawks and colleagues from UC Irvine, the University of Utah and Santa Clara-based gene chip maker Affymetrix Inc. examined genetic data collected by the International HapMap Consortium, which cataloged single-letter differences among the 3 billion letters of human DNA in people of Nigerian, Japanese, Chinese and European descent.

The researchers looked for long stretches of DNA that were identical in many people, suggesting that a gene was widely adopted and that it spread relatively recently, before random mutations among individuals had a chance to occur.

They found that the more the population grew, the faster human genes evolved. That's because more people created more opportunities for a beneficial mutation to arise, Hawks said.

In the last 5,000 to 10,000 years, as agriculture was able to support increasingly large societies, the rate of evolutionary change rose to more than 100 times historical levels, the study concluded.

Among the fastest-evolving genes were those related to brain development, but the researchers aren't sure what made them so desirable, Hawks said.

There are other mysteries too.

"Nobody 10,000 years ago had blue eyes," Hawks said. "Why is it that blue-eyed people had a 5% advantage in reproducing compared to non-blue-eyed people? I have no idea."

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