

Human-chimp difference may be bigger

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Approximately 6 percent of human and chimp genes are unique to those species, report scientists from Indiana University Bloomington and three other institutions. The new estimate, reported in the inaugural issue of Public Library of Science ONE (Dec. 2006), takes into account something other measures of genetic difference do not -- the genes that aren't there.

That isn't to say the commonly reported 1.5 percent nucleotide-by-nucleotide difference between humans and chimps is wrong, said IUB

computational biologist Matthew Hahn, who led the research. IUB postdoctoral researcher Jeffery Demuth is the paper's lead author.

"Both estimates are correct in their own way," Hahn said. "It depends on what you're asking. There isn't a single, standard estimate of variation that incorporates all the ways humans, chimps and other animals can be genetically different from each other."

By studying "gene families" -- sets of genes in every organism's genome that are similar (or identical) because they share a common origin -- the scientists also provide new information about the evolution of humanness. After surveying gene families common to both humans and chimps, the researchers observed in the human genome a significant increase in the duplication of genes that influence brain functions.

"Our results support mounting evidence that the simple duplication and loss of genes has played a bigger role in our evolution than changes within single genes," Hahn said.

That finding complements reports by University of Colorado and University of Michigan researchers in the journals *Science* and *PLoS Biology* earlier this year, in which researchers showed that both gains and losses of individual genes have contributed to human divergence from chimpanzees and other primates.

Hahn and his research partners examined 110,000 genes in 9,990 gene families that are shared by humans, common chimpanzees (*Pan troglodytes*), mice, rats and dogs. The scientists found that 5,622, or 56 percent, of the gene families they studied from these five species have grown or shrunk in the number of genes per gene family, suggesting changes in gene number have been so common as to constitute an evolutionary "revolving door."

The researchers paid special attention to gene number changes between humans and chimps. Using a statistical method they devised, the scientists inferred humans have gained 689 genes (through the duplication of existing genes) and lost 86 genes since diverging from their most recent common ancestor with chimps. Including the 729 genes chimps appear to have lost since their divergence, the total gene differences between humans and chimps was estimated to be about 6 percent.

Hahn said any serious measure of genetic difference between humans and chimps must incorporate both variation at the nucleotide level among coding genes and large-scale differences in the structure of human and chimp genomes. The real question biologists will face is not which measure is correct but rather which sets of differences have been more important in human evolution.

"That's not for me to decide," he said.

Source: Indiana University

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