Comparative genomics for understanding ourselves from the evolutionary viewpoint

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Human–chimpanzee comparative genome research is essential for narrowing down genetic changes involved in the acquisition of unique human features, such as highly developed cognitive functions, bipedalism or the use of complex language. Recent comparative studies have shown that human *FOXP2* is a causative gene of developmental verbal dyspraxia. As the first step of human-chimpanzee comparative genomics for the comprehensive identification of such genetic information, we determined the high-quality DNA sequence of 33.3 megabases of chimpanzee chromosome 22. By comparing the whole sequence with the human counterpart, chromosome 21, we found that 1.44% of the chromosome consists of single-base substitutions in addition to nearly 68,000 insertions or deletions. These differences are sufficient to generate changes in most of the proteins. Indeed, 83% of the 231 coding sequences, including functionally important genes, show differences at the amino acid sequence level. Furthermore, we demonstrate different expansion of particular subfamilies of retrotransposons between the lineages, suggesting different impacts of retrotranspositions on human and chimpanzee evolution. The genomic changes after speciation and their biological consequences seem more complex than originally hypothesized.