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## Chimps are not like humans

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The [vigorous debate](#) on [how different](#) chimpanzees are from humans is fuelled by new data in this week's [Nature](#), as the International Chimpanzee Chromosome 22 Consortium reports that 83% of chimpanzee chromosome 22 proteins are different from their human counterparts (*Nature* 2004, **429**:382-338).

The difference is "much more complicated than we initially imagined or speculated," [Yoshiyuki Sakaki](#), who headed the consortium, told us.

"Our group completed the human chromosome 21 sequence about 3 years ago," Sakaki, director of the RIKEN Genomic Sciences Center, Yokohama City, Japan, told us. Chimpanzee chromosome 22 is the ortholog of human chromosome 21. Despite being very small, human chromosome 21 contains a number of interesting features, including functional genes, centromere and telomere chromosomal structures, and insertions and deletions including Alu and other repetitive elements, Sakaki said.

"So if we analyze this [chimpanzee] chromosome, we can estimate the overall events that have taken place," Sakaki said.

The team sequenced bacterial artificial chromosome genomic DNA libraries from male chimpanzees (*Pan troglodytes*) and aligned chimpanzee chromosome 22 (PTR22) clones with the orthologous human chromosome 21 HSA21q data using NCBI BLAST2 to make a whole-chromosome comparison.

Sakaki said their analysis found about 68,000 insertions or deletions. "That is almost one insertion/deletion every 470 bases," he said. In addition, a small proportion of genes showed a relatively higher rate of evolution than most other genes. "We haven't known what proportion of the genes shows adaptive evolution. This study shows it to be about 2 to 3%," he said.

Early molecular comparisons between humans and chimpanzees suggested that the species are very similar to each other at the nucleotide sequence level - a difference of between 1.23% and 5%, Sakaki said. The results reported this week showed that "83% of the genes have changed between the human and the chimpanzee - only 17% are identical - so that means that the impression that comes from the 1.2% [sequence] difference is [misleading]. In the case of protein structures, it has a big effect," Sakaki said.

But [Derek Wildman](#), at the Center for Molecular Medicine and Genetics at Wayne State University School of Medicine, said that "comparing at least the long arm of these orthologous chromosomes in human and the common chimpanzee showed - to me at least - just how similar humans and chimpanzees actually are."

"[The authors] might have focused a bit with what are the differences, but really what stood out to me was that the chromosomes are nearly the same. There's nothing that major that separates humans from chimpanzees," said Wildman, who was not involved in the study.

Wildman said that [his previous comparison](#) between a greater series of primates - humans, chimpanzees, gorillas, orangutans, and old world monkeys - showed that while many important changes

in human evolution occurred after humans and chimps last shared a common ancestor, many of them also occurred before that divergence. "So there is a limit to what we can learn from the human-chimpanzee comparisons," he said.

"They found a lot of length differences rather than single-base changes, and the fact that those seem to occur in coding sequences more than expected was one of the surprising findings of the paper," said [Matthew Webster](#), from the Evolutionary Biology Centre at Uppsala University, Sweden. "[The authors] also found that there were more changes than you might expect in length within coding sequences which don't interrupt the function."

Webster said that by incorporating gene expression data with comparisons of the human and chimpanzee genes, the authors had provided an approach that would be important in the future, particularly when the [chimpanzee genome](#) was finished.

"[The authors] can compare the rate of adaptive evolution in the genes with the evolution of gene expression, and that will give a much more comprehensive picture of what changes have led to specialization and any specific human features, and so on," said Webster, who was not involved in the study.

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