Comparing Chimp, Human DNA

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Most of the big differences between human and chimpanzee DNA lie in regions that do not code for genes, according to a new study. Instead, they may contain DNA sequences that control how gene-coding regions are activated and read.

"The differences between chimps and humans are not in our proteins, but in how we use them," said Katherine Pollard, assistant professor at the UC Davis Genome Center and the Department of Statistics.

Pollard and colleagues at UC Santa Cruz led by David Haussler looked for stretches of DNA that were highly conserved between chimpanzees, mice and rats. Then they compared those sequences to the human genome sequence, to find pieces of DNA that had undergone the most rapid change since the ancestors of chimps and humans diverged about five million years ago.

They found 202 "highly accelerated regions" or HARs, which showed a high rate of evolution between humans and chimps. Only three of those regions contain genes that are likely to encode proteins. The most dramatically accelerated region, HAR1, appears to make a piece of RNA that may have a function in brain development.

DNA, deoxyribonucleic acid, carries the genetic instructions for making a chimp, a human, a tulip or an amoeba. RNA (ribonucleic acid) is an intermediate molecule that transcribes those instructions to make proteins.

The other highly accelerated regions do not appear to code for genes at all, but many are located close to genes involved in controlling when other genes get made, or in growth and development.

"They're not in genes, but they're near genes that do some very important stuff," Pollard said.

Typically, noncoding regions of DNA evolve more rapidly than regions carrying genes, as there is no selective pressure to stop mutations from accumulating. But the human-accelerated regions are highly conserved across the other groups of animals the researchers looked at, suggesting that they do have important functions that stop them from varying too much.

The work is published in the journal Public Library of Science (PLoS) Genetics. A separate paper on HAR1 was published Aug. 17 in the journal Nature. The study was funded by the National Institutes of Health and the Howard Hughes Medical Institute.

Source: UC Davis