

Evolution is driven by gene regulation

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It is not just what's in your genes, it's how you turn them on that accounts for the difference between species — at least in yeast — according to a report by Yale researchers in this week's issue of *Science*.

“We've known for a while that the protein coding genes of humans and chimpanzees are about 99 percent the same,” said senior author Michael Snyder, the Cullman Professor of Molecular Cellular and Developmental Biology at Yale. “The challenge for biologists is accounting for what causes the substantial difference between the person and the chimp.”

Conventional wisdom has been that if the difference is not the gene content, the difference must be in the way regulation of genes produces their protein products.

Comparing gene regulation across similar organisms has been difficult because the nucleotide sequence of DNA regulatory regions, or promoters, are more variable than the sequences of their corresponding protein-coding regions, making them harder to identify by standard computer comparisons.

“While many molecules that bind DNA regulatory regions have been identified as transcription factors mediating gene regulation, we have now shown that we can functionally map these interactions and identify the specific targeted promoters,” said Snyder. “We were startled to find that even the closely related species of yeast had extensively differing patterns of regulation.”

In this study, the authors found the DNA binding sites by aiming at their function, rather than their sequence. First, they isolated transcription factors that were specifically bound to DNA at their promoter sites. Then, they analyzed the sequences that were isolated to determine the similarities and differences in regulatory regions between the different species.

“By using a group of closely and more distantly related yeast whose sequences were well documented, we were able to see functional differences that had been invisible to researchers before,” said Snyder. “We expect that this approach will get us closer to understanding the balance between gene content and gene regulation in the question of human-chimp diversity.”

Source: Yale University

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