Human and Chimpanzee Functional DNA Shows They Are More Similar To Each Other Than Either Is To Other Apes

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Introduction

Any discussion of the genomic origins of humankind must necessarily include a comparison of our closest living relatives, the chimpanzees. This paper discusses our current state of knowledge about the DNA gene sequences currently available for humans and chimpanzees. We have found that of the genes that have been sequenced humans and chimpanzees share more than 99% of their genetic material. Despite their genetic similarity, there are obvious phenotypic differences between humans and chimpanzees. These phenotypic differences include the size of the brain's neocortex, the mode of locomotion, and the ability to produce complex vocalizations. Our long-term goal is to discover the genetic underpinnings of this phenotypic diversity.

King and Wilson (1975) suggested that most of the genetic causes of phenotypic differences between humans and the great apes are the regulatory sequences that control the timing and pattern of genic activity. However, there are also differences in the structure of the proteins encoded by genes, which undoubtedly account for some of the observed differences in phenotypes. Structural differences in proteins cause those proteins to function differently, especially in the way that multiple proteins interact with each other. This paper examines those structural changes, called nonsynonymous substitutions at the DNA level, that are known to vary within the group of primates that includes humans, the two species of chimpanzees, gorillas, and orangutans. We show that at this functional genetic level humans and chimpanzees are more similar to each...