197h Accelerated Evolution of Genes and Neocortical Expansion in Mammalian Lineages

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The sequencing of the human and many other genomes has allowed the recurrent question of what makes us human to be addressed at the molecular level. Signal phenotypic characteristics of humans and other anthropoid primates are their extended life spans and their enlarged brains relative to their body size, particularly their expanded neocortex. To address the question of which genes might have been involved in the adaptive evolution responsible for these emerging phenotypes we have examined the available comparative genomic data using bioinformatic and evolutionary genetic techniques. In particular, we focused on the evolution of the genes involved in aerobic energy metabolism. Nuclear genomes have provided evidence for positive Darwinian selection acting on these genes in primates, a result that correlates strongly with the increased demand for aerobic energy in the expanded anthropoid primate neocortex. We have also compared the evolutionary rate of mitochondrial genomes among select vertebrates with the encephalization quotient, a measure that normalizes brain to body size. We find that the mitochondrial encoded genes that are involved in accepting electrons from cytochrome *c* show evidence of accelerated rates of change that in primates result in a reduction of electrostatic charge.