

Orangutans harbor ancient primate Alu

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Alu elements infiltrated the ancestral primate genome about 65 million years ago. Once gained an Alu element is rarely lost so comparison of Alu between species can be used to map primate evolution and diversity. New research published in BioMed Central's open access journal *Mobile DNA* has found a single Alu, which appears to be an ancestral great ape Alu, that has uniquely multiplied within the orangutan genome.

Analysis of [DNA sequences](#) has found over a million Alu elements within each primate genome, many of which are species specific: 5,000 are unique to humans, while 2,300 others are exclusive to chimpanzees. In contrast the orangutan lineage (Sumatran and Bornean [orangutans](#)) only has 250 specific Alu.

These tiny pieces of [mobile DNA](#) are able to copy themselves using a method similar to retroviruses. But, because this is an inexact process, a segment of 'host' DNA is duplicated at the Alu insertion sites and these footprints, known as 'target site duplications', can be used to 'identify' Alu insertions. Alu elements can be thought of as molecular fossils, and a shared Alu element sequence and location within the genome indicates a [common ancestor](#).

Researchers from Louisiana State University, in collaboration with the Zoological Society of San Diego and the Institute of Systems Biology in Seattle, found a single Alu which is present in great apes, but absent from gibbons and siamang, and so was likely acquired after ancestors of these species diverged. This founder Alu element was found in an intron (non-coding DNA) on chromosome 7.

Subsequent copying of this Alu, visible as insertions into chromosomes 4, 17, and 12, are unique to orangutans, suggesting that the founder Alu inserted before orangutans separated from other members of the Hominidae (humans, gorillas, and chimpanzees). The Sumatran orangutan also has a copy of this Alu in chromosome 13, and has gained a daughter Alu, which rapidly expanded into chromosomes 21, 2b, and 17. These extra insertions are able to pinpoint the divergence of Sumatran and Bornean orangutans.

The ancestral Alu has been much less active in other great apes, but can still provide information about speciation. While still on chromosome 7 the Alu gained three mutations which can be traced to before the split of gorillas with humans and chimpanzees. It subsequently copied itself into chromosome 3 of humans, indicating that this must have occurred after humans split from bonobos and chimpanzees.

Prof Batzer, who led this research along with Jerilyn Walker and Miriam Konkel, explained "Despite otherwise low activity of Alu retrotransposition in orangutans, this ancestral Alu, still present on chromosome 7, has duplicated more rapidly in orangutans than other Hominidae and likely served as an ancient backseat driver that contributed to the recent orangutan-specific expansion of the Alu family."

Provided by BioMed Central

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