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Life history effects on the molecular clock of autosomes and sex chromosomes

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Evolutionary geneticists date events using the number of mutations that have accumulated since they occurred. For instance, they date the spilt time between humans and chimps by dividing the number of genetic differences between them by the rate at which new mutations arise. Recently those dates have been mired in uncertainty, with new estimates of the mutation rate suggesting that the human splits from chimps and gorillas are more than two times older than previously thought. Importantly, the new split time estimates appear to be at odds with the fossil record.

Researchers at Columbia University introduce a model that considers how life history traits (e.g., age of puberty and reproduction) in parents affect the number of mutations inherited by their children. They find that because life history traits evolve, so should the mutation rate. In other words, the molecular clock is expected to wobble. Based on this model, and using what we know about life history traits in apes, they revisit the question of when humans and other apes split.

Accounting for changes to life history on the ape phylogeny suggests that mutation rates have declined toward the present, supporting the notion of a mutational slowdown. The resulting split time estimates reconcile the genetic and paleontological data, and in particular, they suggest that the human-chimp split may have occurred as recently as 6.6 MYA.

Provided by Columbia University