

Father's age influences rate of evolution

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A male Western chimpanzee (*Pan troglodytes verus*). Credit: Biomedical Primate Research Centre

The offspring of chimpanzees inherit 90% of new mutations from their father, and just 10% from their mother, a finding which demonstrates how mutation differs between humans and our closest living relatives, and emphasises the importance of father's age on evolution.

Published today in *Science*, researchers from the Wellcome Trust Centre

for Human Genetics and the Biomedical Primate research Centre in the Netherlands looked at whether, in chimpanzees, there was a heightened risk of fathers passing on mutations to their children compared to humans.

In humans, each individual inherits, on average, about 70 new mutations from their parents. However, this number is influenced by paternal age such that older fathers tend to result in more mutations – in humans each extra year of age results in two extra mutations.

Mutation risk is linked to father's age because the sperm lineage in males keeps dividing, while females have all the eggs they are ever going to produce present at birth. Paternal age is an established risk factor in a number of disorders including schizophrenia and autism.

The study found that the number of new mutations inherited by chimpanzees from their parents is, on average, very similar to that in humans, but that the effect of the father's age is much stronger – each additional year of father's age results in three extra mutations.

The results suggest that sexual selection can influence the rate of evolution through its effect on the male mutation rate.

Professor Gil McVean, from the Wellcome Trust Centre for Human Genetics at the University of Oxford said: "In humans, a father's age is known to affect how many new mutations he passes on to his children, and is also an established risk factor in a number of mental health disorders.

"This study finds that in chimpanzees the father's age has a much stronger effect on mutation rate – about one and a half times that in humans. As a consequence, a greater fraction of new mutations enter the population through males, around 90 per cent, compared to humans,

where fathers account for 75 per cent of new mutations."

In the study, Wellcome Trust-funded researchers sequenced the genomes of nine western chimpanzees from a three generation family living at the biomedical primate research centre in the Netherlands.

To establish the number of new mutations a child inherits researchers sequence children and their parents and compare the genetic sequence – any change in the sequence that doesn't exist in either parent genome is a new mutation. To find out which parent the mutation comes from you need to sequence members of the next generation of the family.

One explanation for this difference is that [chimpanzees](#), as a result of their mating system, have evolved to produce many more sperm than humans – their testes are over three times the relative size of a [human](#). This means there are likely to be more cycles of sperm production, increasing the opportunity for new [mutations](#) to emerge.

The authors suggest that more work needs to be done across other species to investigate the impact of mating behaviour on mutation rates and male mutation bias.

More information: Venn O et al. Strong male bias drives germ line mutation in chimpanzees. *Science* 2014:

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