Mitochondrial DNA mutations affect male and female fertility and ageing

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Research indicates for the first time that mutations within the DNA sequence of mitochondria impact on the energy producing capacity of these cells, with significant effects on fertility and life expectancy - and remarkably different outcomes for males and females.

The research published today in *Current Biology* was led by PhD student Florencia Camus and Dr. Damian Dowling in the School of Biological Sciences at Monash University, with Dr Ted Morrow (University of Sussex, UK) and Dr Jochen Wolf (Uppsala University, Sweden).

Lead researcher Florencia Camus, said that using Drosophila (the fruit fly) as a model organism, the research team had identified a single nucleotide mutation in the mitochondrial DNA sequence which encodes one of the core energy producing genes.

"This mutation made males sterile but remarkably the ill effects were observed only in males; females who harbour this mutation maintain their fertility. This very same mutation that causes male infertility results in them living longer than flies that don't have this mutation. However, while remaining fertile, females that carry this mutation have shorter lives," Ms Camus said.

Co-author Dr Ted Morrow, University of Sussex, said that this mutation is not the only one located within the mitochondria to affect longevity.

"We identified genetic affects that could be pinned down to another core mitochondrial gene. With this gene, flies that produce lots of this protein suffer from shorter longevity – but only if they are male," Dr Morrow said.

Dr Damian Dowling suggested the study represents a breakthrough when tracking naturally occurring, single mutations located at key energy producing genes within the mtDNA.

"This means that by pinpointing these single mutations, not only can we observe impacts on mitochondrial function associated with these mutations, but also on key health considerations like fertility and life expectancy," Dr Dowling said.

"The remarkable thing about these findings is that these mutations affect male fruit flies very differently from females. Certain mutations appear to be beneficial to one sex, but harmful to the other. This provides novel insights and ways of thinking into how the genes of the mitochondria might also shape aspects of human health."

More information: "Single Nucleotides in the mtDNA Sequence Modify Mitochondrial Molecular Function and Are Associated with Sex-Specific Effects on Fertility and Aging," *Current Biology* (2015). DOI: 10.1016/j.cub.2015.09.012

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