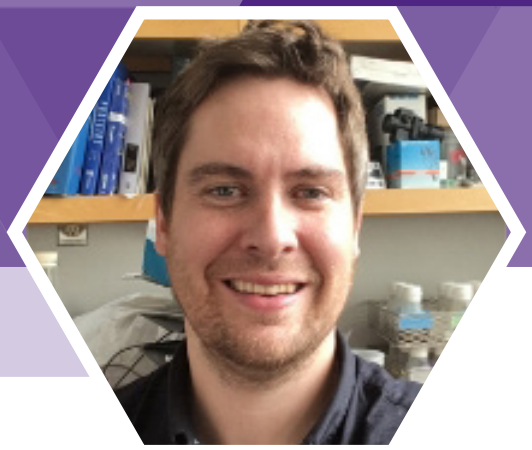
Biology Seminar

Western
UNIVERSITY · CANADA

12:30 - 1:30 pm
Friday, November 22, 2019
BGS 0165



Thomas Hurd
Assistant Professor
Department of Molecular Genetics
University of Toronto

Divide and conquer: how deleterious mitochondrial DNA is eliminated in the germline

In most species, mitochondrial DNA (mtDNA) is inherited maternally, subject to high mutation rates, and undergoes no recombination. This makes mtDNA susceptible to the accumulation of deleterious mutations. Left unchecked, the increased genetic load would result in dysfunction of the mitochondria and ultimately species decline. To prevent this, the female germline has evolved a selection mechanism to purge itself of mutant mtDNA. Despite its fundamental biological importance, the mechanism underpinning mtDNA selection has remained very poorly understood. Using an allele-specific fluorescent in situ hybridization approach, we have observed that mtDNA selection first manifests in the early stages of *Drosophila* oogenesis. We find that just prior, mitochondria undergo a sustained period of fragmentation, during which wildtype and mutant mtDNA are physically separated into different mitochondrial fragments, allowing mitochondria harboring mutant genomes to be identified and selectively eliminated. Remarkably, not only is prolonged fragmentation necessary, but it is also sufficient to induce selection in somatic ovarian tissues where it otherwise does not appreciably occur. Our studies posit a generalizable mechanism to select against deleterious mtDNA mutations that may allow the development of strategies for treatment of mtDNA disorders.

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