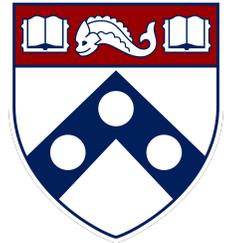


Diversification of the SprT-like Gene Family and Functional Consequences for Chromosome Transmission



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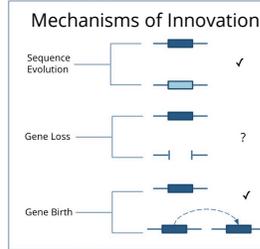
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Introduction: SprT-like Gene Family

- SprT-like genes are characterized by a SprT-like protease domain which cleaves DNA-protein crosslinks (DPCs)
- SprT-like genes maintain genome integrity in many chromatin-mediated processes including replication, transcription, and chromatin remodeling
- There are four SprT-like family members in *D. melanogaster*: MH, GCNA, CG11322, CG2694

Maternal Haploid (MH)

- Important for DNA replication progression
- Expressed in ovaries in *D. melanogaster*



MH Expression

ovary testis

melanogaster

simulans

sechellia

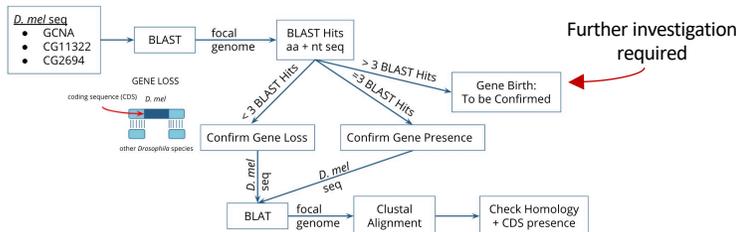
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- MH diversifying rapidly (McDonald-Kreitman test), providing evidence for sequence evolution
- Evidence for recent MH gene birth, with young duplicate gene expressed in different tissue
- Have other SprT-like genes diversified?

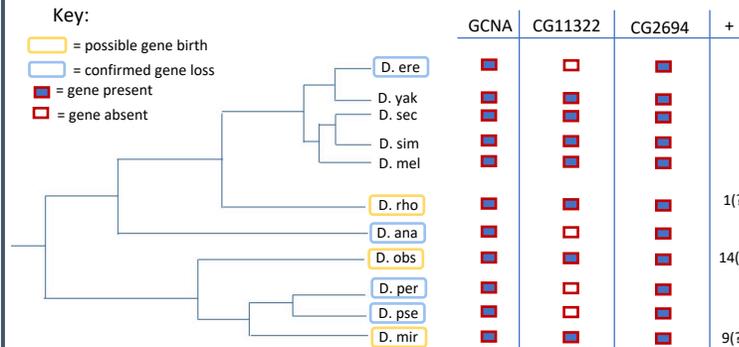
Phylogenomics of SprT-like Gene Family

- Evidence for adaptive sequence evolution in CG11322 (testis expressed) and CG2694 (ovary and testis expressed) (McDonald-Kreitman Test)
- Gene birth and death evolution unknown → focus of investigation

I. Methods



I. Results

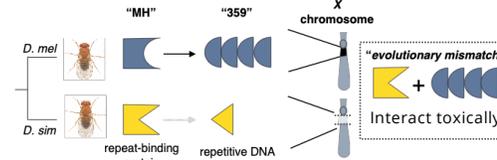


- These data suggest that SprT-like genes undergo birth and death in short evolutionary time
- What evolutionary force could drive diversification of SprT-like family? → Model: coevolution with rapidly evolving DNA satellites

MH-359 Satellite Coevolution

- D. mel* mh colocalizes to the "359 satellite" present on the X chromosome in *D. mel*, but absent in *D. sim*
- D. mel* 359 interacts toxically with MH[sim], damaging DNA and compromising oogenesis, supporting a model of coevolution between MH and 359

How did a deleterious satellite become species-wide?



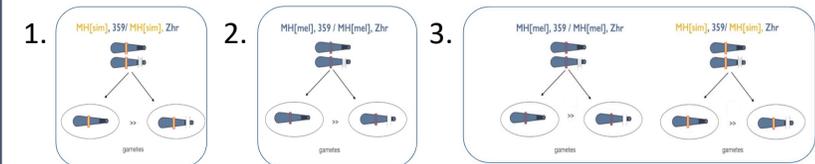
Transmission Distortion

- Could 359 proliferation be driven by transmission distortion?
- Large satellites are potentially able to recruit more centromere proteins and bias transmission to oocyte (meiotic drive)
- Question: Does the 359 satellite have biased transmission to the oocyte?

II. Methods

- Crossed 359/Zhr (359 deletion) heterozygote ♀ encoding either mh[mel] or mh[sim] to Zhr ♂
- PCR to determine presence or absence of 359 in offspring

II. Predictions



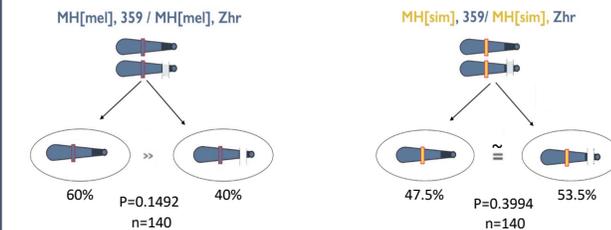
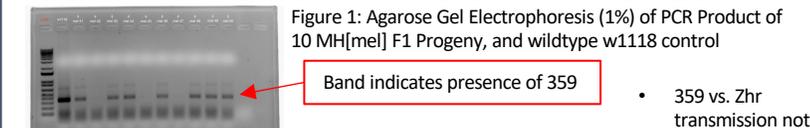
Interpretations:

MH[sim] not adapted → cannot suppress 359 transmission bias

MH[mel] is adapted → helps/is neutral to 359 transmission bias

mh acts in independent pathway

II. Results



- 359 vs. Zhr transmission not statistically significant, but trend of 359 transmission bias in MH[mel]
- More data to be collected
- Rapid evolution of 359 could be due instead to genetic drift

Acknowledgements

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