Contribution of transposable elements in the sex gap longevity of different Drosophila species

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Abstract

In Drosophila, like in many other animal species, females tend to live longer than males, a phenomenon known as sex gap in longevity (SGL). One of the possible causes underlying this phenomenon could be related to the high number of transposable elements (TE) in the Y chromosome (toxic Y effect). TE activity is normally repressed by epigenetic mechanisms. However, it is known that this regulation is disrupted with age. Since the Y chromosome is rich in TEs, more TEs may become active in old males than in old females, generating more somatic mutations, and reducing longevity in males. In this work, we studied the natural variation in SGL in several natural populations of three different Drosophila species that vary in their TE content: *Drosophila melanogaster*, *Drosophila simulans*, and *Drosophila suzukii*. Furthermore, we found that the replacement of the Y chromosome between strains with different SGL reduces male lifespan over generations and thus increases SGL, suggesting an important role of the Y chromosome in male longevity. Finally, RNA-seq analysis from old and young flies suggested that there is an increased number of upregulated TE families in old samples, and more specifically in old males compared to old females, and that the total fraction of transcripts derived from repeats increase during aging depending on the species and the population tested. Overall, this work tries to better understand the genomic differences that lead to variation in longevity patterns between sexes, and emphasizes the importance of TEs in male longevity.

Keywords: Transposable Elements, longevity, natural populations, Y chromosome

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