Evolution rate of insulin component Pten gene in *Drosophila* species

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Abstract

Signaling pathways that are vital to processes such as regulating growth and metabolic homeostasis are conserved across different species such as mammals and insects. For example, the insulin signaling pathway is involved in regulating growth and metabolic homeostasis. The components are encoded by many genes, such as Pten (phosphatase and tensin homolog), which are evolutionarily conserved across animals. Insulin pathway genes may evolve relative to the location of the components in the pathway. This study examined whether there is a direct relationship between the evolution rate of *Pten* and the phylogenetic distance of three divergent *Drosophila* species from the model species, *Drosophila melanogaster*. Furthermore, this study compared the evolutionary rates of two insulin pathway genes, *Pten* and *Foxo*, to identify whether genes evolve at rates with respect to their position in the pathway. The *Pten* gene in *Drosophila suzukii*, *Drosophila miranda*, and *Drosophila navojoa* was annotated using *D. melanogaster* as the gene model in accordance with a protocol from the Genomic Education Partnership (GEP) Pathways project. Similarly, *Foxo* was annotated in *Drosophila rhopaloa*, *D. miranda,* and *D. navojoa* and data from this annotation was obtained. Protein sequence data was also analyzed, and genetic distance was measured by MEGA (molecular evolutionary genetics analysis). Successful annotation of *Pten* in *D. suzukii* and *D. miranda* and *Foxo* in *D. rhopaloa* and *D. navojoa* was performed and this data was used to calculate genetic distance. However, the annotation of the Pten ortholog in *D. navojoa* and Foxo ortholog in *D. miranda* was not completed to the likelihood they have not been sequenced or catalogued yet or these orthologs do not exists in the respective species, which is unlikely. Therefore, the comparison between *Pten* and *Foxo* was not possible. MEGA results revealed that there was a greater amount of amino acid substitutions per site in all but one isoform of Pten in the more distant clade, *D. miranda* than *D. suzukii*, the more closely related species to *D. melanogaster*. The results support that evolution rates of more phylogenetically distant species are greater than more closely related species.